HIGHLIGHTS

REVISION NO. 33 Jun 01/10

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
CHAPTER 71		
L.E.P. 1- 5	Revised to Reflect this revision indicating new,revised, and/or deleted pages	
T. OF C. 1- 5	Revised to reflect this revision	
71-00-00 233, 238	Minor additions and amplification Layout improved **REVISED VIBRATION GUIDELINES**	
71-00-00 502- 505, 518- 598, A502-A548	Effectivity updated at the bottom of the page Minor additions and amplification **REVISED SAFETY PRECAUTIONS ABOVE IDLE.** **ADDED OIL PRESSURE TRANSMITTER TO OIL SYSTEM TEST REQUIREMENTS.** **DELETED PRE/POST SB 73-6025 INDICATION.** Layout improved	
71-00-00 604- 606, 608- 610, 614- 615, 619- 620, 623- 625, 629- 631	Layout improved	
71-11-00 602, 604- 605	Layout Improved or Effectivity Updated	
71-13-00 4, 13- 15	Minor additions and amplification **ADDED SAFETY STATEMENT TO DESCRIPTION PROCEDURE.** Layout improved	
71-13-00 301- 302, 305- 314	Minor additions and amplification **UPDATED SERVICING PROCEDURE TO ADD CAUTIONS AND WARNINGS.** **REVISED FIG. "THRUST REVERSER DOOR HOLD OPEN**	

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
	RODS AND ACTUATOR MANIFOLD".	
71-13-02 602, 604- 605	Layout Improved or Effectivity Updated	
71-13-03 201	Minor additions and amplification REVISED DESIGNATION OF PUSH-PULL GAGE.	
71-13-03 402	Minor additions and amplification REVISED EQUIPMENT AND MATERIALS TABLE.	
71-13-03 501, 504	Minor additions and amplification REVISED DESIGNATION OF PUSH-PULL GAGE. Layout improved	
71-13-03 601	Minor additions and amplification REVISED DESIGNATION OF PUSH-PULL GAGE.	
71-13-05 501	Minor additions and amplification REVISED DESIGNATION OF PUSH-PULL GAGE.	
71-13-06 601- 602	Minor additions and amplification REVISED DESIGNATION OF PUSH-PULL GAGE.	
71-31-01 601- 602	Mod.5994M6845 incorporated No definition	

Printed in France

CHAPTER 71

POWER PLANT

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively
Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary

CH/SE/SU	C	PAGE	DATE
RECORD			
OF TEMP.			
REVISION			
L.E.P.	R	1- 5	Jun01/10
T. of C.	R	1	Jun01/10
T. of C.	R	2	Jun01/10
T. of C.	R	3	Jun01/10
T. of C.	R	4	Jun01/10
T. of C.	R	5	Jun01/10
71-00-00		1	Dec01/06
71-00-00		2	Jun01/04
71-00-00		3	Jun01/04
71-00-00		4	Jun01/04
71-00-00		5	Jun01/04
71-00-00		6	Jun01/04
71-00-00		7	Jun01/04
71-00-00		201	Jun01/08
71-00-00		202	Jun01/04
71-00-00		203	Jun01/08
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71-00-00	R	505	Jun01/10
71-00-00		506	Jun01/04
71-00-00		507	Jun01/04
71-00-00		508	Jun01/04

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
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71-13-03		406	Jun01/09
71-13-03		407	Jun01/09

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71-13-03		408	Jun01/09
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CHAPTER 71

POWER PLANT

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1. Definition (Ref. Fig. 001)
The power plant assembly described herein is designed for a P&W engine of the PW4000 series having a thrust of 52,000 lbs (PW4152 engine model).

2. General Description (Ref. Fig. 002, 003, 004)

A. The aircraft is powered by two PW4000 series turbofan engines mounted below and forward of the wings. The engines are individually supported in pylon-mounted nacelles with forward and aft mounts designed to absorb thrust and vertical side loads, and to allow for engine growth due to thermal expansion.
The nacelles include thrust reverser doors which are mated with the engine casing to stiffen it, performing a function known as "cowl loadshare".
For a description of the mounts, see 71-20-00, Description and Operation.
For an explanation of cowl loadshare, Ref. 71-13-00, Description and Operation.

B. The engine components and accessories are accessible for maintenance and service operations through hinged fan cowl doors, hinged thrust reverser doors, and access doors in the panels of the nose cowl, fan cowl, and thrust reverser doors. For a description of the fan cowl, see 71-13-00, Description and Operation. For a description on the thrust reverser system, see 78-30-00, Description and Operation.

C. The exhaust nozzle is fastened to the engine turbine case at Flange T with high-strength, external wrenching bolts.
A tee-ring around the forward end of the nozzle provides tha aft bearing surface for the thrust reverser doors in their cowl load-share function.
For a description of the turbine exhaust system, see 78-11-00, Description and Operation.

D. Major components installed on each engine, in addition to the basic engine accesssories, include the integrated-drive-generator (IDG), the engine pneumatic starter, N1 and N2 tachometer transmitters, hydraulic pumps, thrust reverser mechanisms, splitter gearbox, pneumatic drive unit and ducting, drain tubing, valves, manifolds, and drain mast, bleed air ducting, anti-ice ducting and sensors.

E. An engine mounted vent and drain system collects and discharges drained fluids overboard from the engine. For a description of the engine drains system, see 71-70-00, Description and Operation.

R **ON A/C 101-104,

R Post SB 72-2032 For A/C 101-104,

1. Definition (Ref. Fig. 001)
The power plant assembly described herein is designed for a P&W engine of the PW4000 series having a thrust of 56,000 lbs (PW4156A engine model).

2. General Description (Ref. Fig. 002, 003, 004)

A. The aircraft is powered by two PW4000 series turbofan engines mounted below and forward of the wings. The engines are individually supported in pylon-mounted nacelles with forward and aft mounts designed to absorb thrust and vertical side loads, and to allow for engine growth due to thermal expansion.
The nacelles include thrust reverser doors which are mated with the engine casing to stiffen it, performing a function known as "cowl loadshare".
For a description of the mounts, see 71-20-00, Description and Operation.
For an explanation of cowl loadshare, Ref. 71-13-00, Description and Operation.

B. The engine components and accessories are accessible for maintenance and service operations through hinged fan cowl doors, hinged thrust reverser doors, and access doors in the panels of the nose cowl, fan cowl, and thrust reverser doors. For a description of the fan cowl, see 71-13-00, Description and Operation. For a description on the thrust reverser system, see 78-30-00, Description and Operation.

C. The exhaust nozzle is fastened to the engine turbine case at Flange T with high-strength, external wrenching bolts.
A tee-ring around the forward end of the nozzle provides tha aft bearing surface for the thrust reverser doors in their cowl load-share function.
For a description of the turbine exhaust system, see 78-11-00, Description and Operation.

D. Major components installed on each engine, in addition to the basic engine accesssories, include the integrated-drive-generator (IDG), the engine pneumatic starter, N1 and N2 tachometer transmitters, hydraulic pumps, thrust reverser mechanisms, splitter gearbox, pneumatic drive unit and ducting, drain tubing, valves, manifolds, and drain mast, bleed air ducting, anti-ice ducting and sensors.

E. An engine mounted vent and drain system collects and discharges drained fluids overboard from the engine. For a description of the engine drains system, see 71-70-00, Description and Operation.

**ON A/C 101-200,

3. Engine

A. The PW4000 series engine is a two-spool, axial-flow turbofan engine of high compression and high bypass ratio. This engine incorporates two multistage, turbine-driven compressors utilizing concentric shafts. The low pressure N1 compressor, consisting of one fan stage and four compressor stages, is driven by the engine four-stage turbine. The high pressure N2 eleven

stages of compression are driven by a two-stage turbine. For a description of the basic engine and accesssories, see 72-00-00, Description and Operation

4. Nacelle

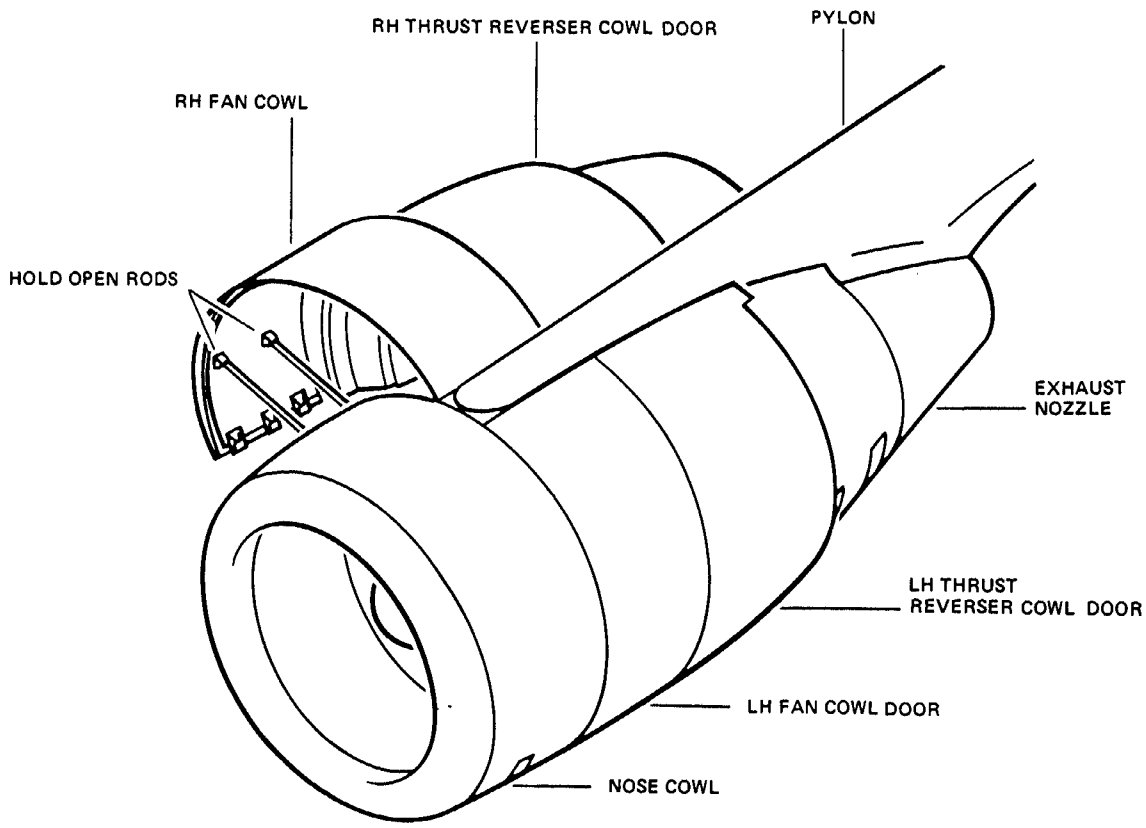
A. The nacelle section is a composite of skins and panels which envelops the power plant and provides protection for the engine. The nacelle is comprised of the nose cowl, fan cowl, and thrust reverser cowl. A nozzle and plug are mounted on the aft flanges of the engines core to complete the power plant. (Ref. Fig. 001, 002).

B. The nacelle section is attached to the wing of the aircraft by a pylon through which it transmits forward and reverse thrust, electrical and hydraulic power, and heated, pressurized engine bleed air for environmental control.

C. Nacelle dimension (Ref. Fig. 003, 004)

D. Approximate weights and physical characteristics for the PW4000 nacelle system are as follows :

COMPONENT	WEIGHT	LENGTH
Engine (dry) with EBU, Mounts, and Inlet Cowl	12845 lbs (5826 kg)	197.9 in. (5026.7 mm)
Inlet Cowl	544 lbs (247 kg)	59.3 in. (1506.2 mm)
Primary Nozzle	207 lbs (93.9 kg)	40.8 in. (1036.3 mm)
Exhaust Plug	42 lbs (19 kg)	38 in. (965.2 mm)
Cowl Doors (per engine)	145.6 lbs (66.2 kg)	40.7 in. (1033.8 mm)
Thrust Reverser Doors (per engine)	1460 lbs (662 kg)	98.0 in. (2489 mm)
EBU Systems	762 lbs (345.6 kg)	
Mounts Aft	84.8 lbs (38.5 kg)	26.7 in. (678.2 mm)
Mounts Forward	75.0 lbs (34.1 kg)	18 in. (457 mm)



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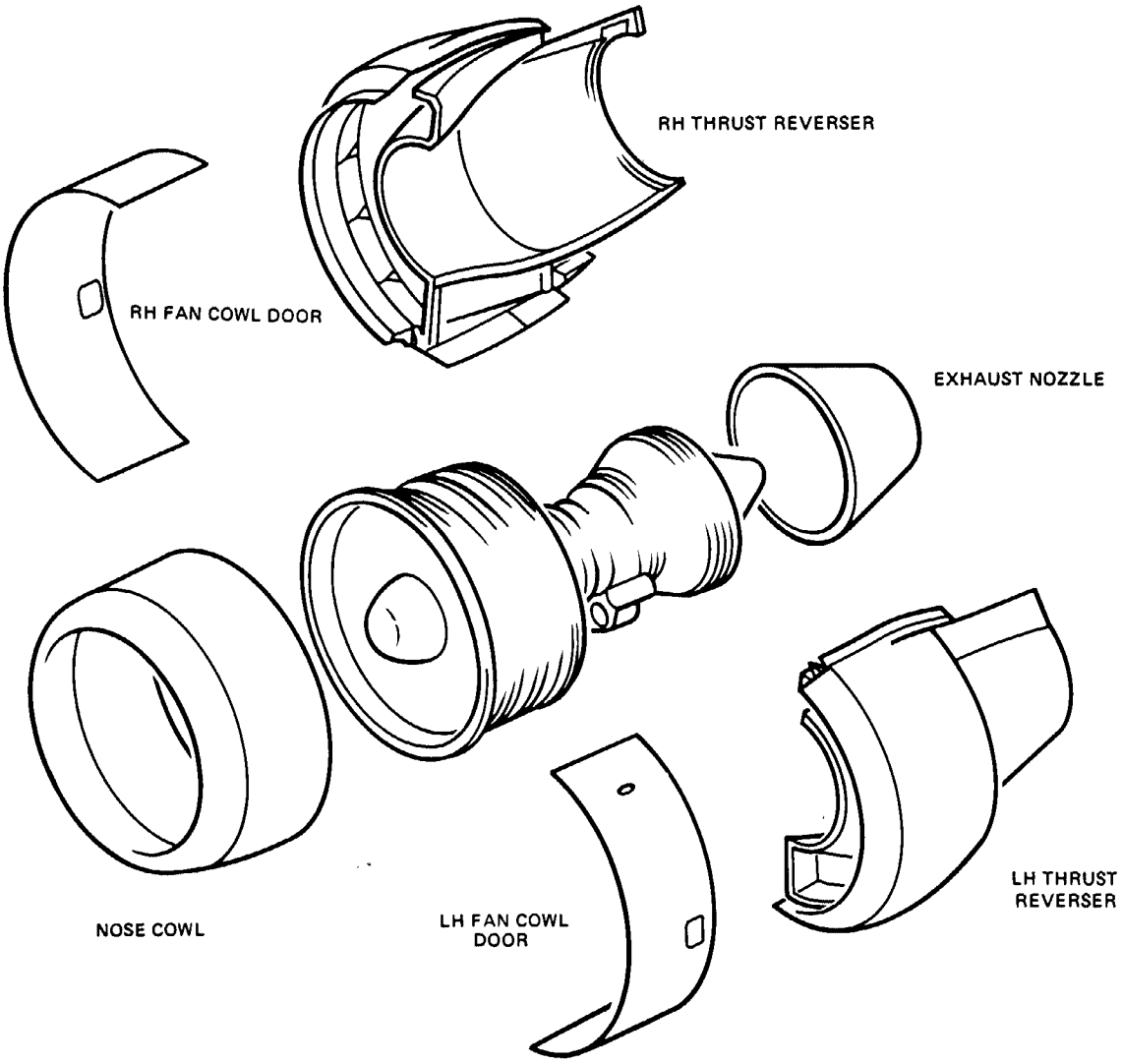
Power Plant
Figure 001



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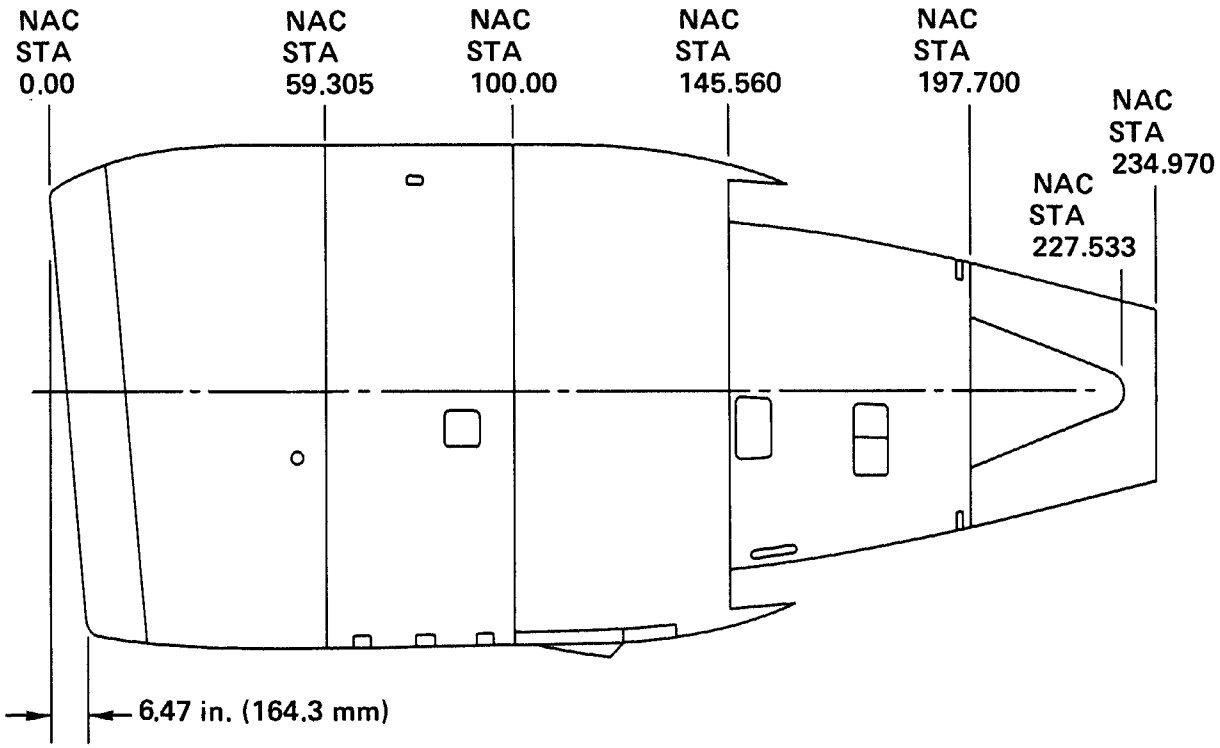
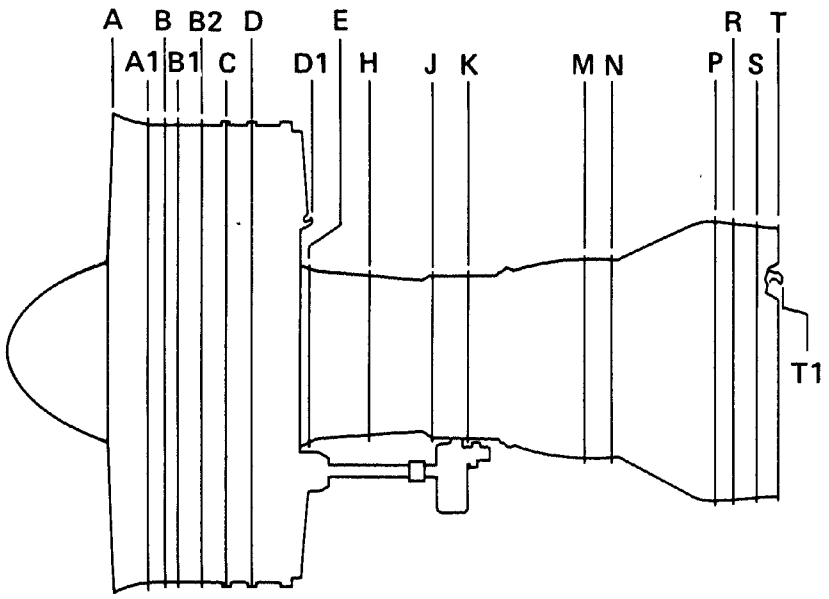
Main Components
Figure 002





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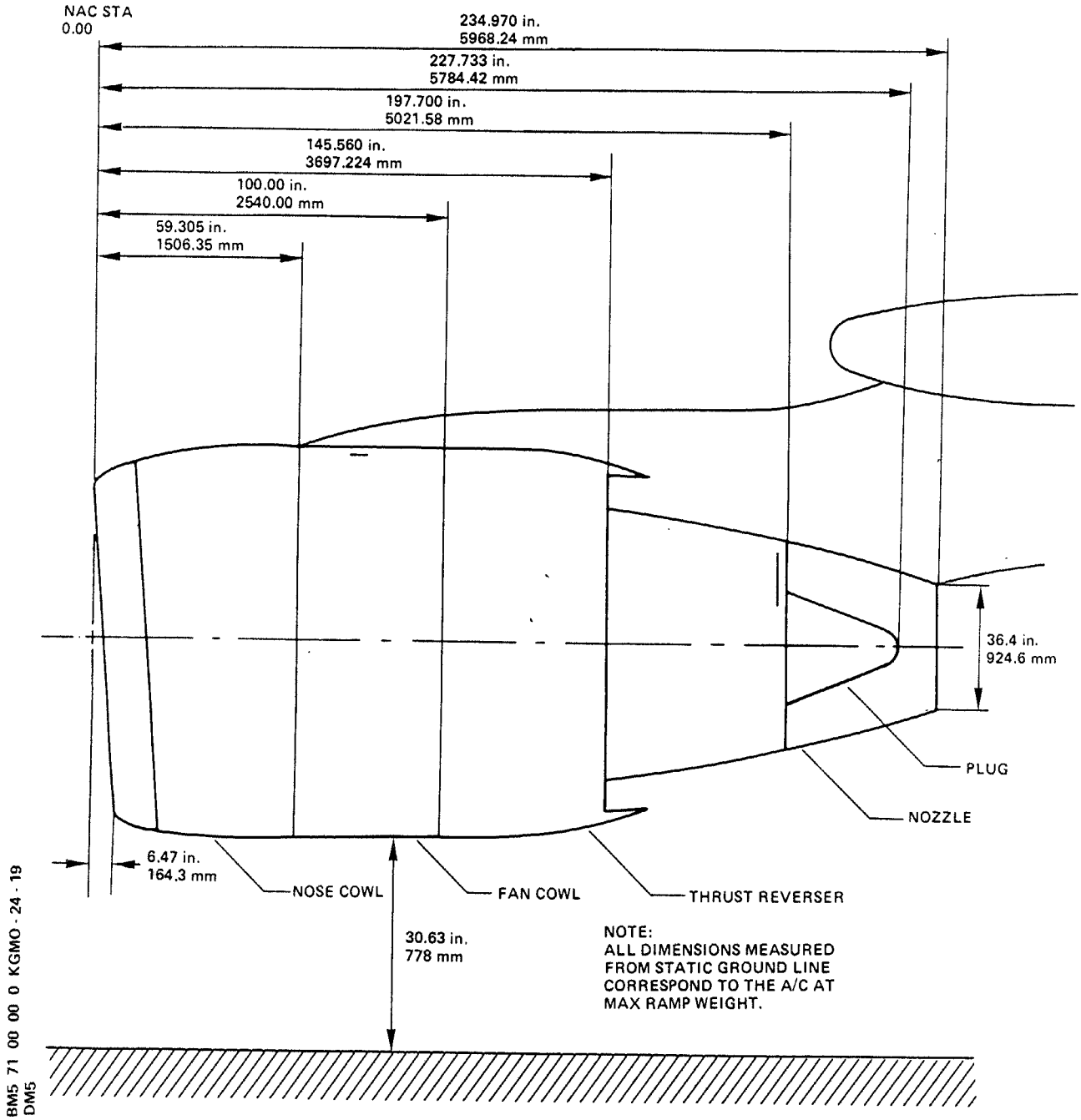
L-A142R

Nacelle Configuration
Figure 003



Nacelle Dimensions
Figure 004

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 31-51-00, P. Block 001	ECAM - General
- 71-00-00, P. Block 501	Power Plant - General
- 72-00-00, P. Block 601	Engine - General
- 72-00-00, P. Block 701	Engine - General
- 74-00-00, P. Block 601	Ignition

2. Engine Safety Precautions

A. Operating characteristics of jet engine - powered aircraft necessitate care to prevent injury to personnel and damage to engine or property.

(1) Engine noise

WARNING : EAR PROTECTIVE EQUIPMENT MUST BE WORN BY PERSONNEL WORKING NEAR AIRCRAFT WHILE ENGINES ARE RUNNING.

(a) Jet engines produce noise capable of causing temporary, as well as permanent loss of hearing. Even short exposures to extreme noise may result in damage to ears and all personnel must use some means of protection. Noise can affect ear mechanism in such a way as to cause unsteadiness or inability to walk or maintain balance.

(b) Engine noise danger areas are provided in (Ref. Fig. 201) for Ground Idle, Break-Away, and Take-Off power settings.

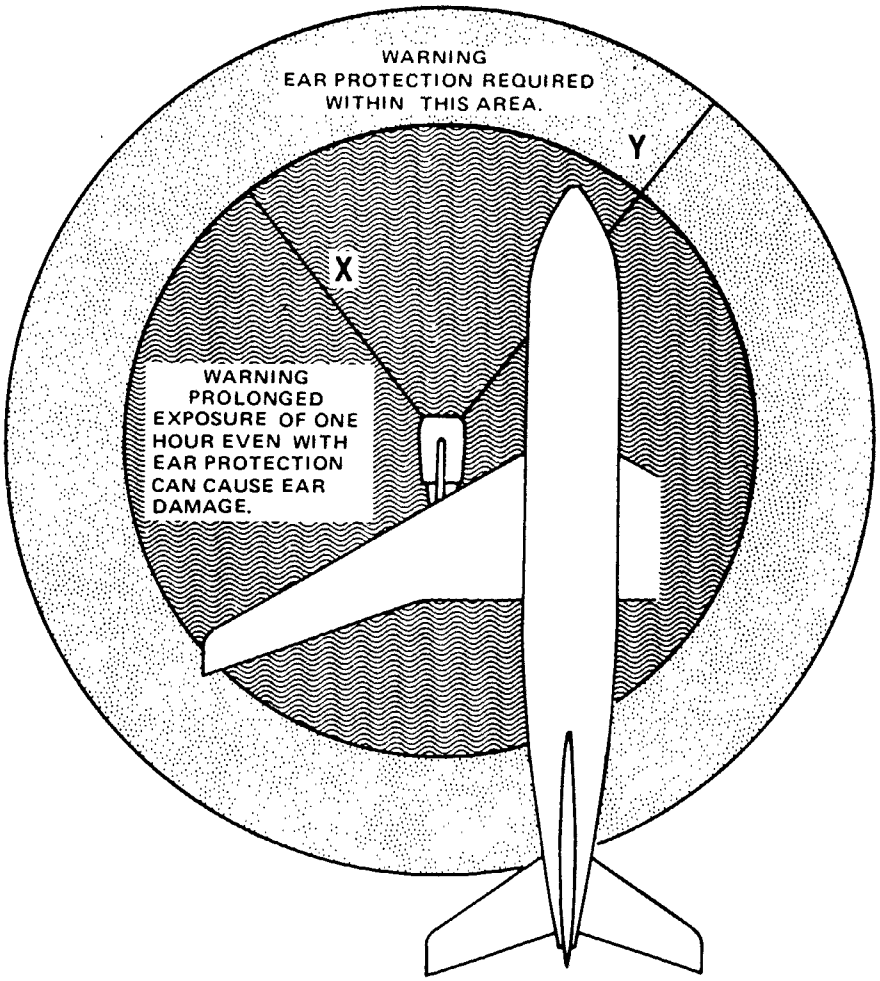
(2) Danger area during ground engine running operation.

(a) General

WARNING : AVOID DANGER AREAS IN FRONT AND REAR OF ENGINE DURING GROUND RUNNING OPERATIONS.
EYE PROTECTION MUST BE WORN BY PERSONNEL WORKING NEAR AIRCRAFT WHILE ENGINES ARE RUNNING.
CAUTION MUST BE USED WHEN PARKING AIRCRAFT FOR RUN-UP, TO AVOID INJURY TO PERSONS, OR DAMAGE TO PROPERTY.

WARNING : ENGINE IS CAPABLE OF DEVELOPING ENOUGH SUCTION AT INLET DUCT TO PULL A PERSON UP TO, OR PARTIALLY INTO DUCT, WITH POSSIBLY FATAL RESULTS. PERSONNEL MUST AVOID EXHAUST NOZZLE WHERE HOT, HIGH- VELOCITY EXHAUST GASES ARE DISCHARGED.
VELOCITY OF FAN DISCHARGE AIR IS SUFFICIENTLY HIGH TO CAUSE SERIOUS INJURY. WHEN THRUST REVERSER IS IN REVERSE THRUST POSITION, FAN AIR IS DISCHARGED FORWARD.

CAUTION : BEFORE OPERATING ENGINE, INLET AND AREA IN PROXIMITY TO INLET MUST BE CHECKED FOR LOOSE OBJECTS AND EQUIPMENT WHICH COULD BE DRAWN INTO ENGINE. FOREIGN OBJECTS CAN CAUSE SEVERE DAMAGE TO ENGINE WHEN INGESTED. RUNNING SHOULD BE KEPT TO A MINIMUM AND PROLONGED RUNNING AT MAXIMUM OPERATING LIMITS



POWER SETTING	RADIUS X	RADIUS Y
GROUND IDLE	75 FT. (23m)	100 FT (30m)
BREAK AWAY	90 FT (27m)	115 FT (35m)
TAKE–OFF	125 FT (38m)	200 FT (60m)

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Engine Noise Danger Areas
Figure 201

AVOIDED.

CAUTION : NEVER ATTEMPT TO TIE OR STRAP THE FAN BLADES TO THE FAN EXIT GUIDE VANES AS A MEANS OF ROTOR CONSTRAINT. SEVERE ENGINE DAMAGE MAY RESULT.

WARNING : AT HIGH ENGINE SPEEDS FAN DISCHARGE AND ENGINE EXHAUST MAY PICK UP AND BLOW LOOSE DIRT, STONES, SAND, AND DEBRIS A DISTANCE OF SEVERAL HUNDRED FEET.
OCCASIONALLY, WHEN ENGINE IS STARTED, EXCESS FUEL ACCUMULATED IN TAILPIPE IGNITES AND LONG FLAMES ARE BLOWN OUT OF EXHAUST NOZZLE. THIS HAZARD MUST BE CONSIDERED AND ALL FLAMMABLE MATERIALS KEPT CLEAR.
CARBON MONOXIDE CONTENT IS LOW BUT OTHER GASES ARE PRESENT WHICH HAVE DISAGREEABLE ODOR AND ARE IRRITATING. EXPOSURE WILL USUALLY CAUSE EYE IRRITATION, AND MAY CAUSE RESPIRATORY IRRITATION, PARTICULARLY IN CONFINED SPACES OR AREAS WHERE CONCENTRATION MAY BUILD UP.

CAUTION : ENGINE EXHAUST TEMPERATURE IS SUFFICIENT TO DETERIORATE ASPHALT/TARMAC PAVEMENT. CONCRETE APRONS ARE RECOMMENDED FOR RUN-UP AREAS.

(b)Air intake (Ref. Fig. 202) (Sheet 1/2 and 2/2)

(c)Exhaust

1 Jet wake diagrams (Ref. Fig. 203, 204, 205)

- Jet wake diagrams are at standard sea level static conditions.

(d)Air intake and exhaust danger areas in reverse thrust configuration (Ref. Fig. 206)

(3)Engine ignition

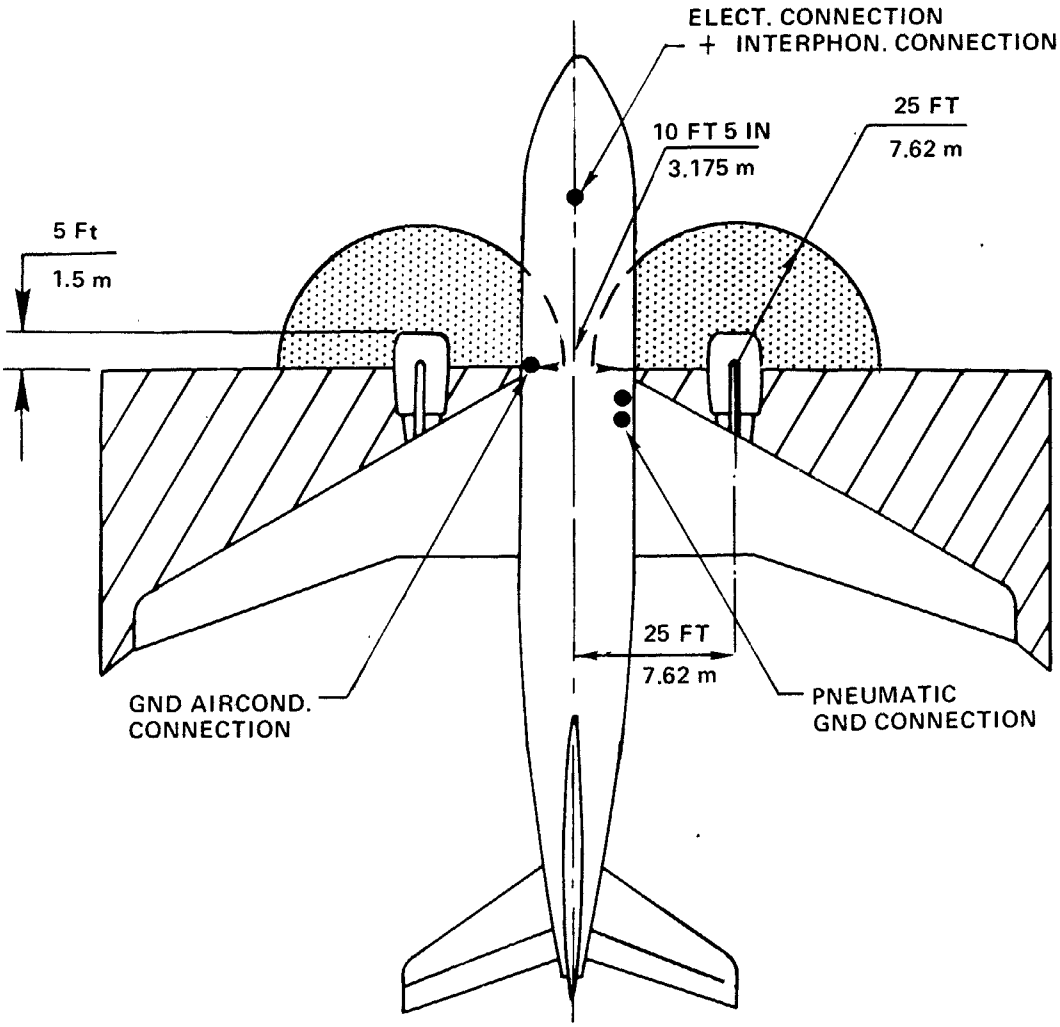
WARNING : AVOID CONTACT WITH ANY PART OF ENGINE IGNITION SYSTEM UNLESS DEACTIVATED.
ENGINE IGNITION SYSTEM USES HIGH ENERGY CAPABLE OF PRODUCING HAZARDOUS OR POSSIBLY FATAL ELECTRICAL SHOCK.

(4)Engine starting

WARNING : BEFORE YOU OPERATE THE ENGINES AT POWER SETTINGS ABOVE IDLE, MAKE SURE THAT ACCESS DOOR 136AR IS OPEN. THIS IS TO MAKE SURE THAT THERE IS NO RISK OF RESIDUAL PRESSURE IN THE AIRCRAFT AFTER ENGINE SHUTDOWN.
IF PERSONNEL TRIES TO OPEN A DOOR WHEN THERE IS RESIDUAL PRESSURE IN THE AIRCRAFT :
- THE DOOR CAN OPEN WITH DANGEROUS SUDDEN FORCE
  AND
- THERE IS A RISK OF DEATH OR BAD INJURY AND DAMAGE TO THE AIRCRAFT.

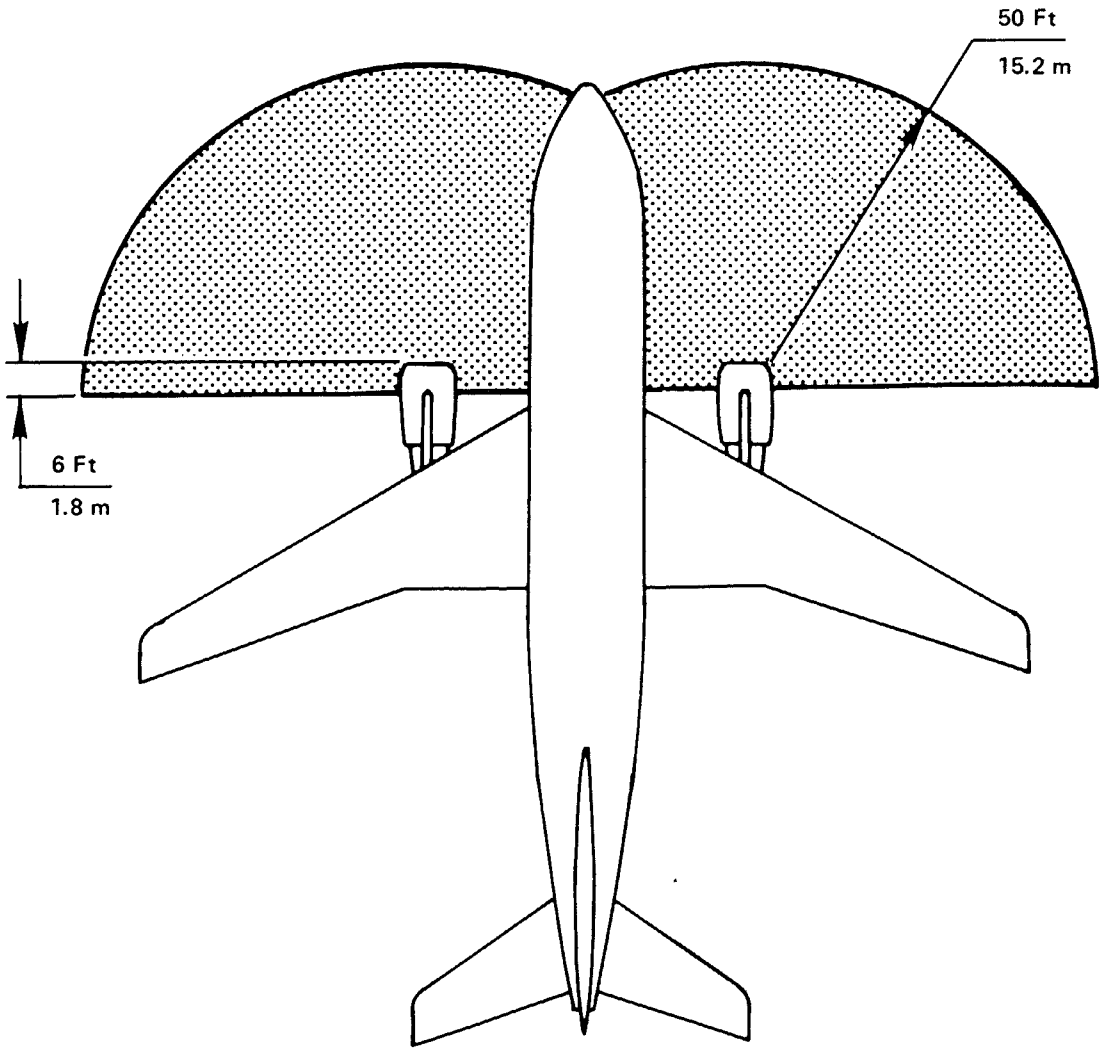
WARNING : MAKE SURE THAT :
- THE PASSENGER/CREW DOORS ARE CLOSED AND THE PASSENGER LOADING STAIRS ARE REMOVED WHEN AT LEAST ONE ENGINE IS OPERATED ABOVE IDLE POWER.
- THE CARGO DOORS ARE CLOSED AND CARGO LOADING EQUIPMENT IS REMOVED WHEN :
  - ENGINE 2 IS OPERATED AT IDLE OR ABOVE
  - AT LEAST ONE ENGINE IS OPERATED ABOVE IDLE POWER.

IF YOU DO NOT OBEY THESE PRECAUTIONS INJURY TO THE PERSONNEL AND DAMAGE TO THE AIRCRAFT AND/OR EQUIPMENT CAN OCCUR.



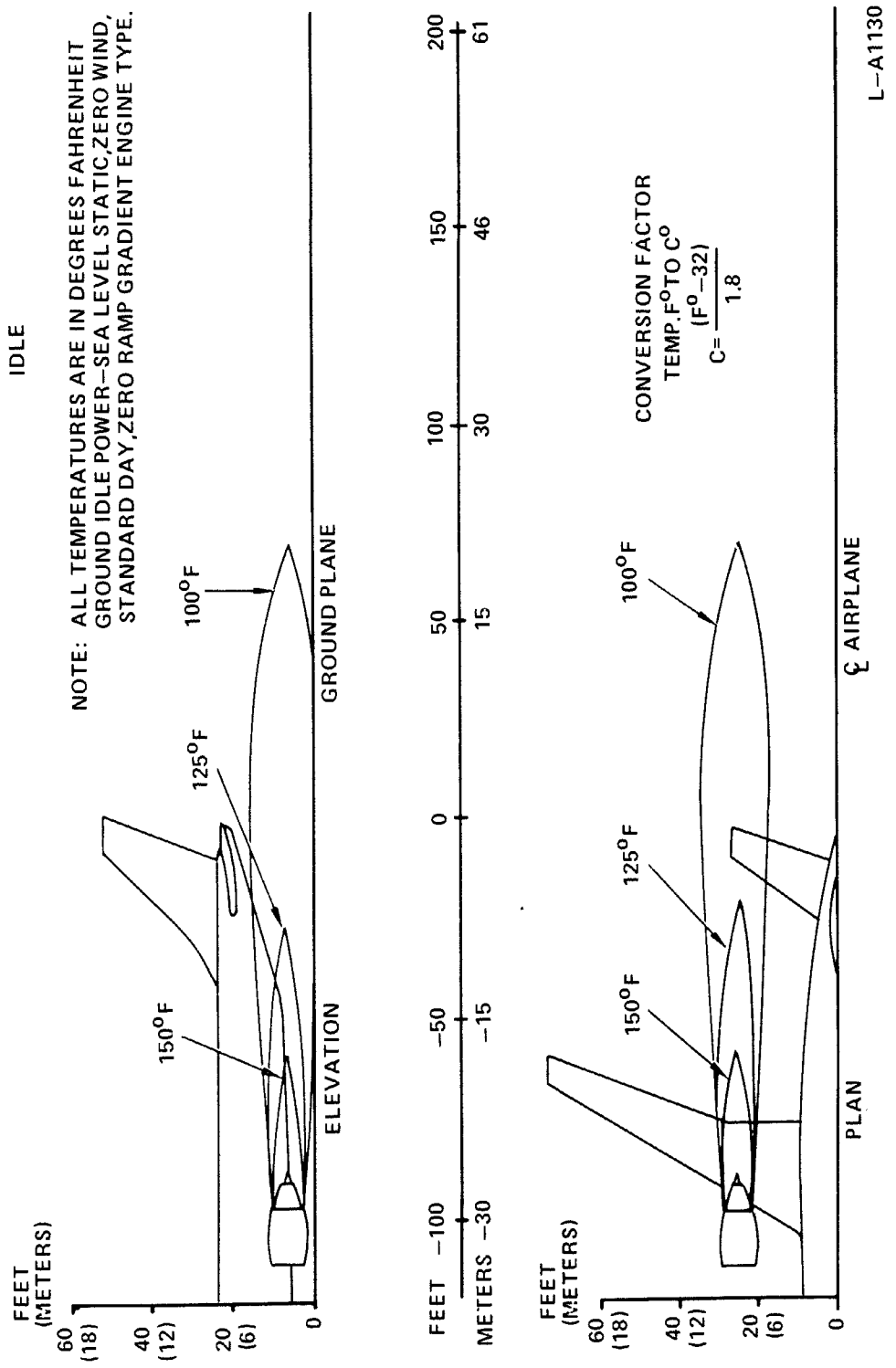
BM5 71 00 00 2 KAMA - 20

Jet Suction Area - Ground Idle (Sheet 1/2)
Figure 202



BM5 71 00 00 2 KAMB - 20

Jet Suction Area - Takeoff Thrust (Sheet 2/2)
Figure 202



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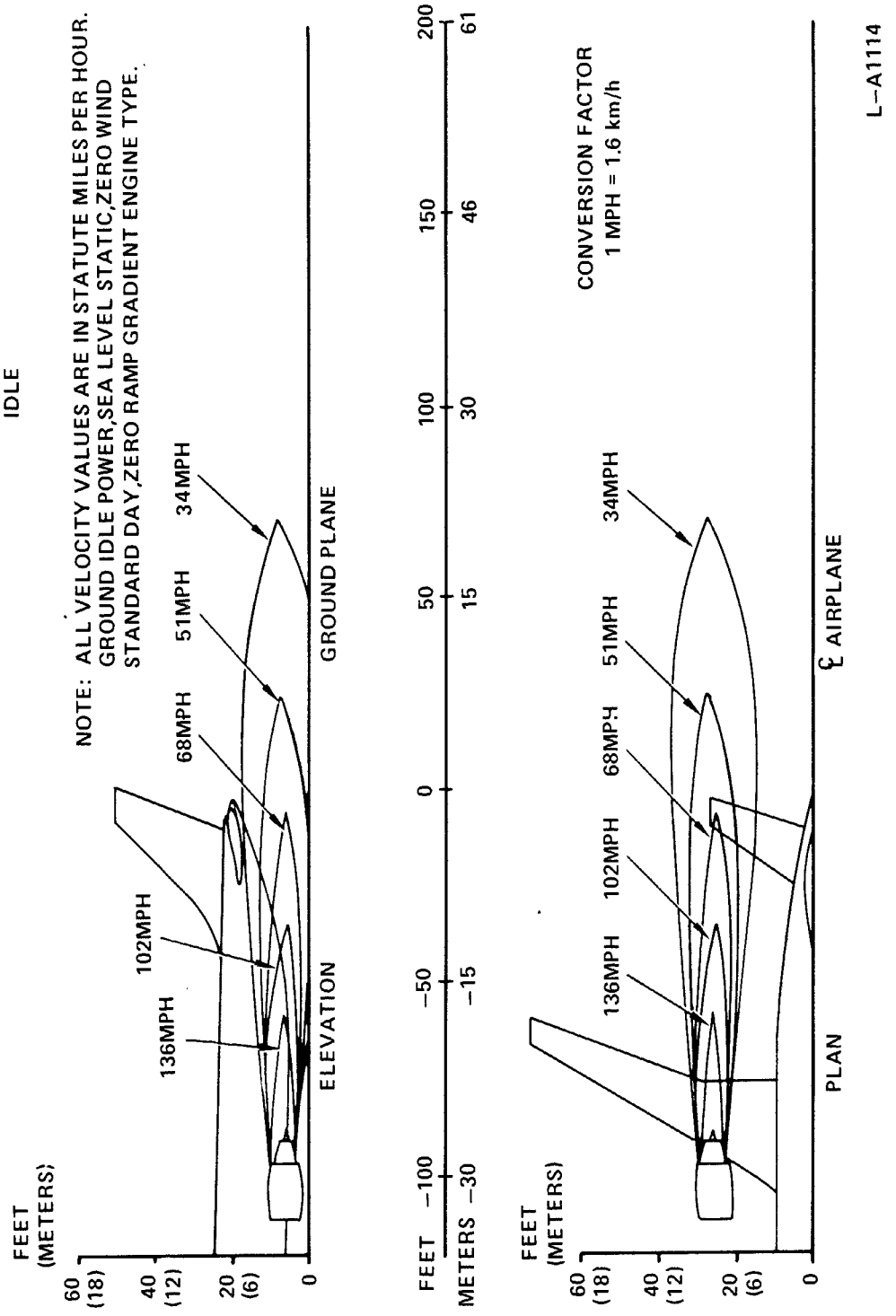
Jet Wake Diagram - Idle (Sheet 1/2)
Figure 203



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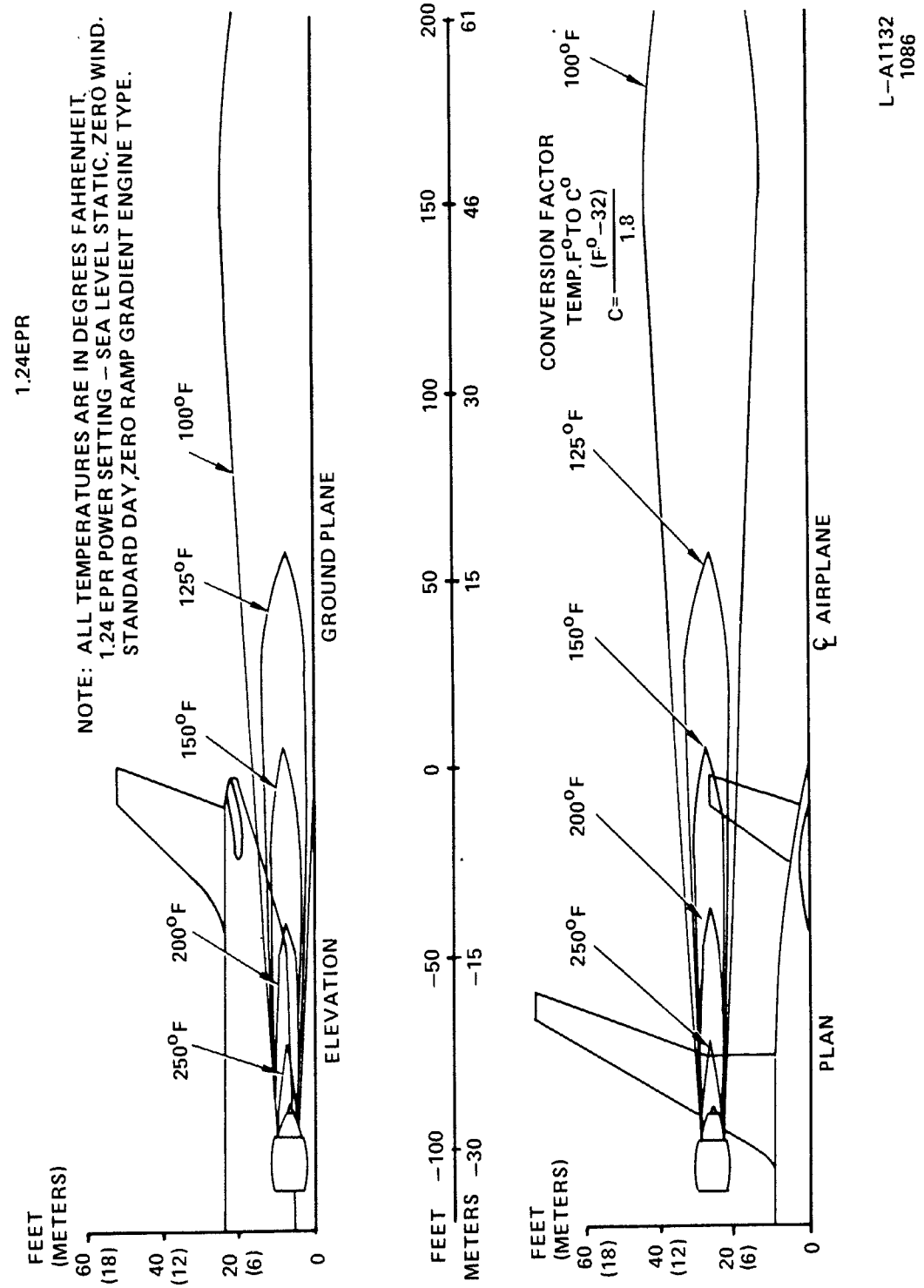
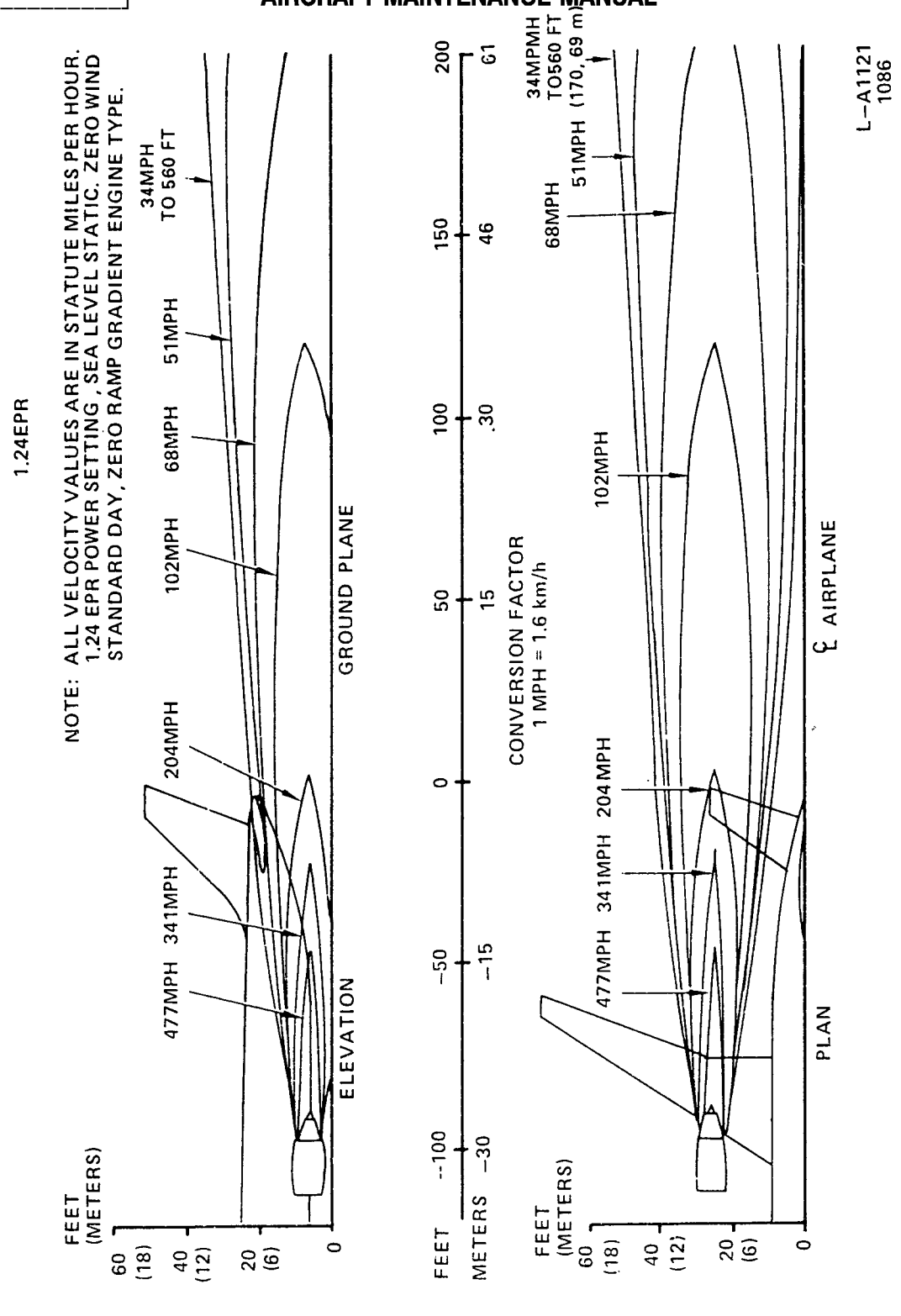
Jet Wake Diagram - Idle Thrust (Sheet 2/2)
Figure 203



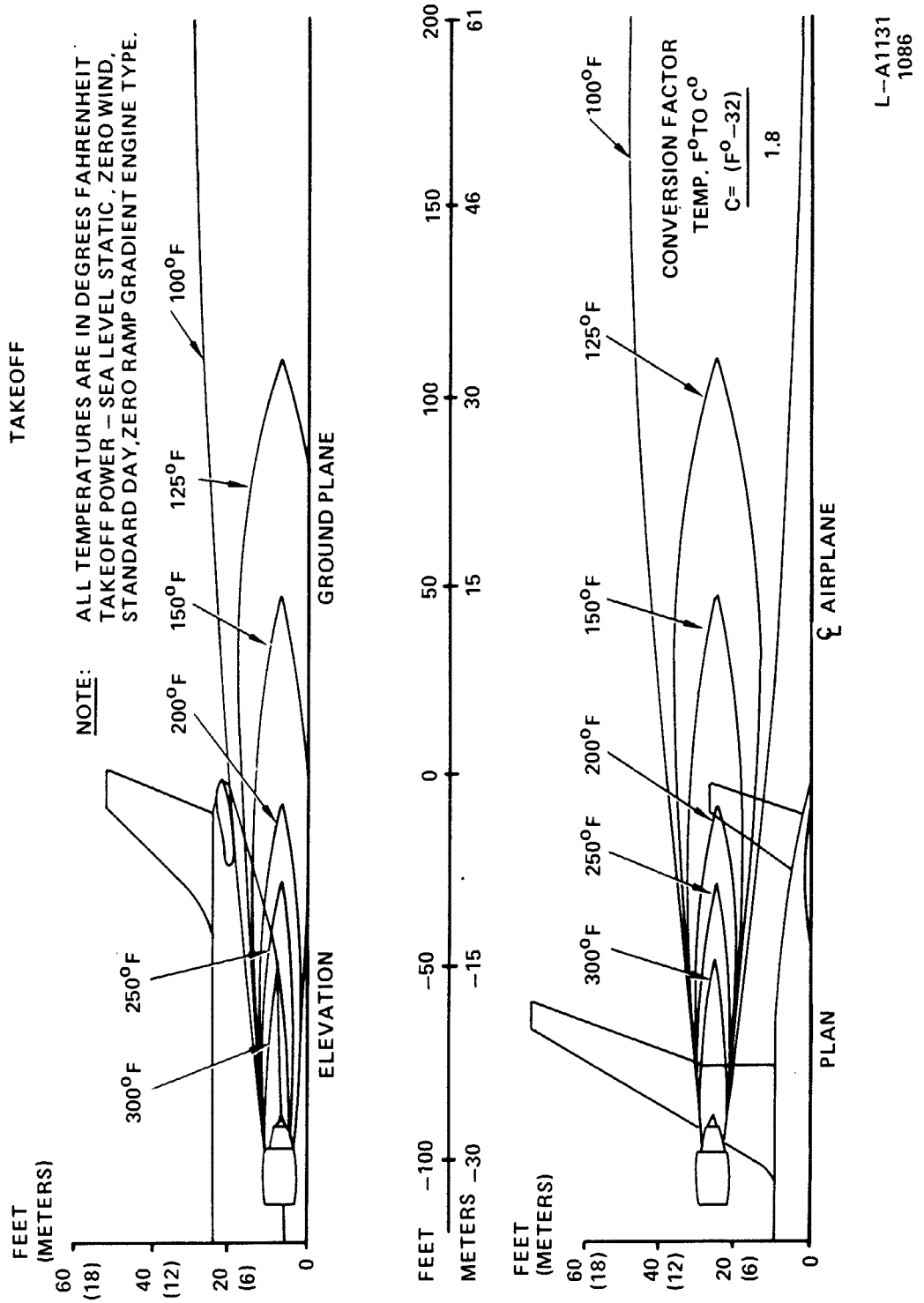
BM5 71 00 00 2 KCMA - 20

Jet Wake Diagram - 1.24 EPR (Sheet 1/2)
Figure 204



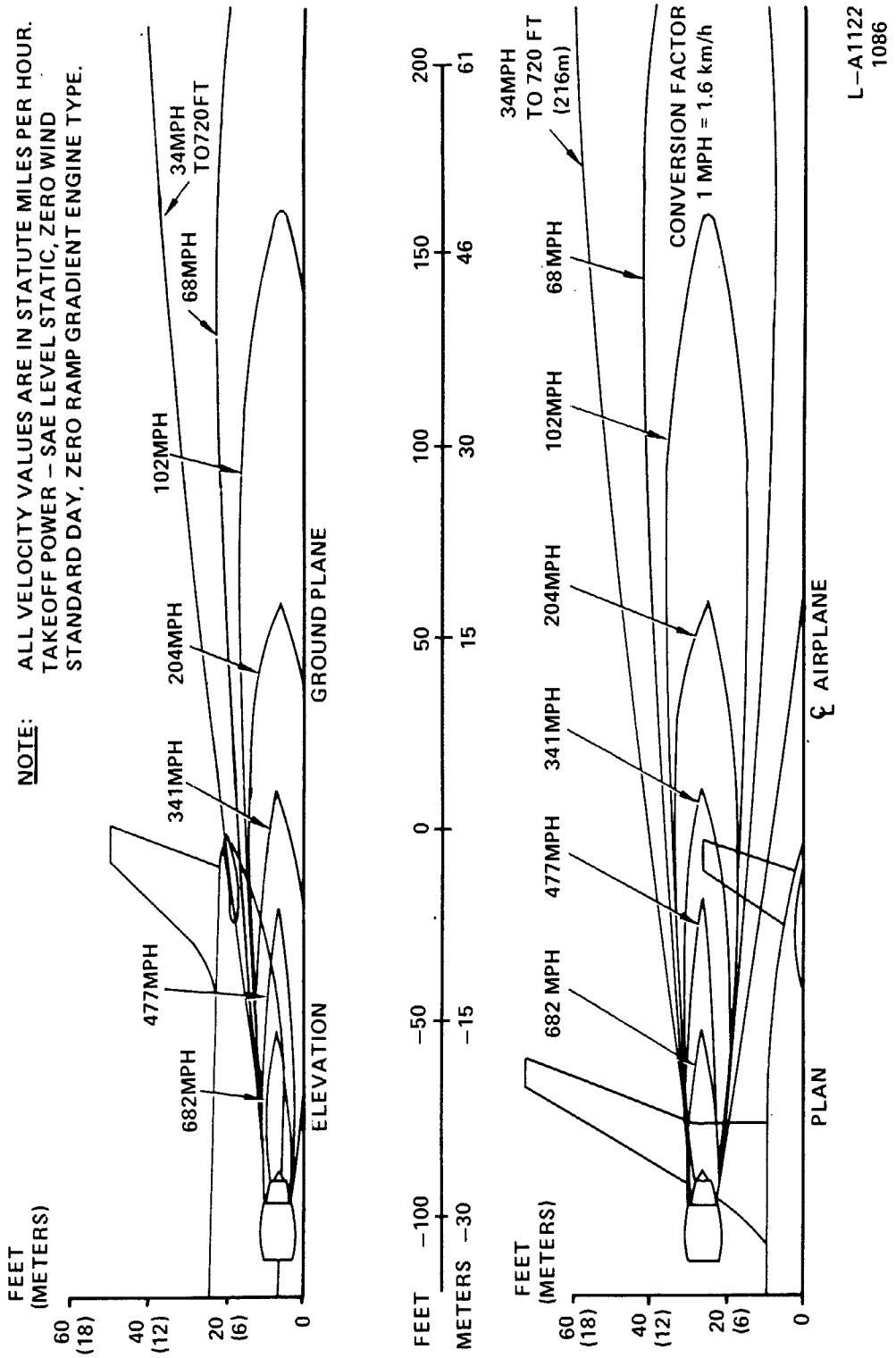
BMS 71 00 00 2 KCMB-01

Jet Wake Diagram - 1.24 EPR (Sheet 2/2)
Figure 204

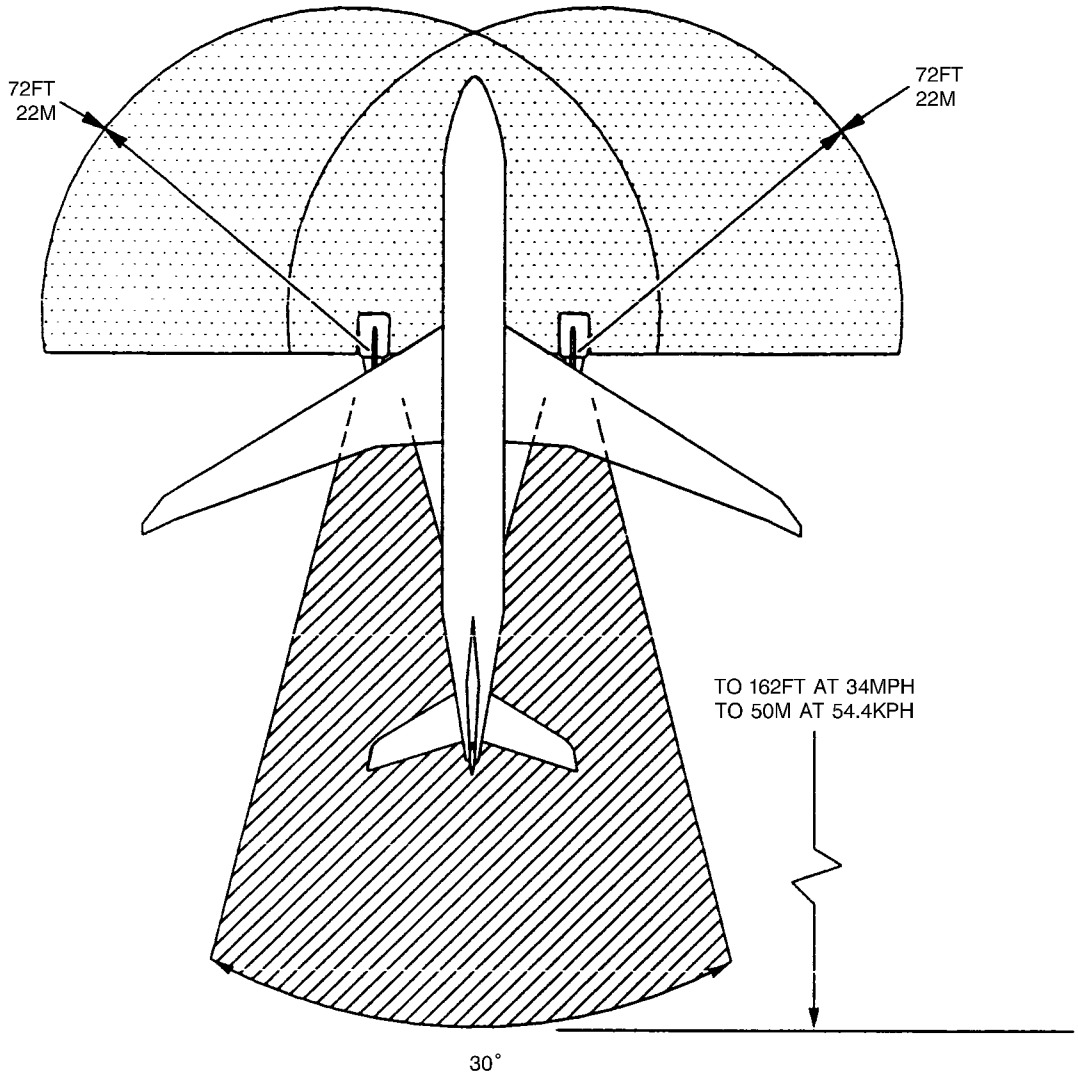


Jet Wake Diagram - T.O - EPR (Sheet 1/2)
Figure 205

BM5 71 00 00 2 KDMA - 20



Jet Wake Diagram - T.O - EPR (Sheet 2/2)
Figure 205



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R Reverse Thrust At Idle Power - Danger Area
Figure 206

(5)Engine cool down

WARNING : DO NOT TOUCH, OR COME IN CONTACT WITH, No. 3 BEARING BUFFER AIR COOLER OR ASSOCIATED TUBING FOR 3.0 HOURS AFTER ENGINE HAS BEEN SHUT DOWN. FAILURE TO COMPLY CAN RESULT IN SERIOUS BURNS.

(a)After engine operation it is recommended that no work or inspection be done on the hot section or tailpipe for one-half hour (preferably longer). With the exception of the buffer air cooler noted above, all other parts may be worked upon without danger.

(6)Compressor bleed valve

WARNING : WHEN CHECKING BLEED VALVE OPERATION OR DOING OTHER WORK ADJACENT TO COMPRESSOR BLEED VALVE WHILE ENGINE IS RUNNING, CARE SHOULD BE TAKEN TO STAND CLEAR DURING BLEED VALVE OPEN OPERATION.
WHEN BLEED VALVE OPENS, HIGH PRESSURE AIR AT HIGH VELOCITY IS DUMPED OVERBOARD. EXPERIENCE HAS PROVEN THAT THE FORCE OF THIS AIR, PARTICULARLY WHEN THE VALVE FIRST OPENS DURING DECELERATION FROM HIGH RPM, IS SUFFICIENT TO TAKE A PERSON OFF HIS FEET, RESULTING IN POSSIBLE INJURY.

(7)General

(a)No. 3 bearing buffer air cooler (Ref. Fig. 207).

WARNING : DO NOT TOUCH, OR COME IN CONTACT WITH, No. 3 BEARING BUFFER AIR COOLER OR ASSOCIATED TUBING FOR 3.0 HOURS AFTER ENGINE HAS BEEN SHUT DOWN.
FAILURE TO COMPLY CAN RESULT IN SERIOUS BURNS.

1 No. 3 bearing buffer air cooler can reach 950°F (510°C) during high power running and requires time to cool.

(b)Deicing fluid

CAUTION : DO NOT SPRAY DEICING FLUID INTO OPERATING ENGINE. FLUID WILL CONTAMINATE AIRFOILS, AND PERFORMANCE DETERIORATION MAY RESULT.

(c)X-rays

CAUTION : THE FADEC AND SUPPLEMENTARY CONTROL UNIT (SCU) CAN BE DAMAGED BY A CUMULATIVE EXPOSURE TO X-RAYS. THEY MUST BE REMOVED BEFORE EXPOSING THE ENGINE TO X-RAYS.

(d)Fuel/oil

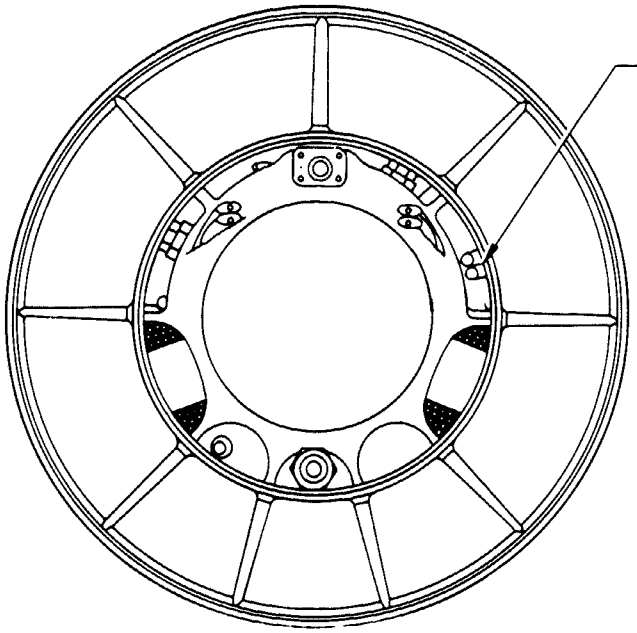
WARNING : ALL FUELS/OILS HAVE A DESICCATING EFFECT WHICH DRIES THE SKIN. PRECAUTIONS SHOULD BE TAKEN TO AVOID CONTACT AS MUCH AS POSSIBLE.

(e)Compressor surge

CAUTION : NEVER ADVANCE, OR FAIL TO RETARD, THRUST LEVER ON AN ENGINE THAT IS SURGING AS ENGINE DESTRUCTION CAN RESULT.
DO NOT FAIL TO FOLLOW DESCRIBED START PROCEDURE FOLLOWING EMERGENCY ENGINE SHUTDOWN. DAMAGE TO TURBINE BLADE TIP SEALS COULD RESULT.

CAUTION : TO REDUCE POSSIBILITY OF COMPRESSOR SURGE (STALL) AND/OR OVERTEMPERATURE DURING GROUND OPERATIONS, ALL ENGINE RUNNING FOR MAINTENANCE PURPOSES THAT DOES NOT REQUIRE BLEEDS CLOSED INFORMATION SHOULD BE ACCOMPLISHED AT POWER LEVELS BELOW 2.5 BLEED CLOSURE. (APPROXIMATELY 75 PERCENT N1).

1 If compressor surge is encountered, RAPIDLY (in less than one second) retard thrust lever to idle, select fuel cutoff with fuel



INTERMEDIATE CASE
REAR VIEW

L–A1727

BM5 71 00 00 2 KEMO .20

No. 3 Bearing Buffer Air Cooler
Figure 207

switch, and motor engine until EGT has been driven below 356°F (180°C). Refer to paragraph for Engine Start Procedure Following Emergency Shutdown.

NOTE : Non recoverable surge can be recognized by a rapidly increasing EGT, decreasing fuel flow, sudden loss of rotor speeds and an inability of engine to respond to throttle movement. Surge at idle or low thrust may possibly be characterized by an abnormally high stabilized EGT and lack of throttle response. Engine can be restored to normal operation only by shutdown and restart.

(f)Engine overtemperature

CAUTION : TO REDUCE POSSIBILITY OF COMPRESSOR SURGE (STALL) AND/OR OVERTEMPERATURE DURING GROUND OPERATIONS, ALL ENGINE RUNNING FOR MAINTENANCE PURPOSES THAT DOES NOT REQUIRE BLEEDS CLOSED INFORMATION SHOULD BE ACCOMPLISHED AT POWER LEVELS BELOW 2.5 BLEED CLOSURE. (APPROXIMATELY 75 PERCENT N1).

1 When EGT limits are exceeded, under conditions other than surge, engine should not be shut down on an emergency basis, but should be cooled five minutes at idle unless it is obvious that continued operation will result in additional engine damage. Regardless of how engine is shut down, it should not be restarted until inspection shows that both engine rotors will rotate normally and appropriate overtemperature inspection requirements have been accomplished (Ref. 72-00-00, P. Block 601).

2 If overtemperature is encountered as a result of surge, engine must be shut down as described in step (e) above.

(g)Thrust lever movement

NOTE : Performance deterioration can result from increased gaspath seal clearance caused by wear associated with high thermal gradients which occur during rapid thrust changes. To minimize turbine seal wear, whenever feasible, any appreciable thrust increase or decrease should be accomplished by slow, smooth thrust lever movement as described below.

1 Snap accelerations and decelerations will not result in deterioration if the following recommendations are observed.

- Idle at least 5 minutes after initial startup and before normal engine shutdown.
- If the engine is run to high power (above 1.4 EPR) for more than 30 seconds, including the acceleration time, and then returned to idle, stabilization time at idle should either be less than one minute or greater than 10 minutes before snap reacceleration to high power. This recommendation can be waived, if the re-acceleration is performed slowly (a minimum of 60 seconds).

(8)Wind direction

(a)Wind direction and velocity affects ground operation of engine and overtemperature and/or stall conditions may be encountered. Strictly observe all caution notes including wind direction diagrams pertaining to engine operation as specified in (Ref. 71-00-00, P. Block 501).

(9)Clean engine gaspath after use of fire extinguishing agents.

(a)(Ref. 72-00-00, P. Block 701).

(10)Clean engine gaspath after use of fire extinguishing agents (Continue-In-

Service).
(a)(Ref. 72-00-00, P. Block 701).
(11)Warning note
(a)At one time, some engine parts contained asbestos fibers and it is possible that some of these parts continue in service. Refer to the commercial engine service bulletins for a listing of parts that once contained asbestos. In some parts, the material that contains asbestos may be within an adhesive. It is important to use correct precautions during work with these parts. Operators must obey all local regulations and employer work policies when parts that contain asbestos are handled or discarded.
(b)The asbestos used in Pratt & Whitney engine parts was usually encapsulated and will not release dust unless the parts are ground, sanded, drilled, scraped, cut, or broken. While it is our experience that these operations do not usually generate asbestos at levels in excess of permissible exposure limits, operators must use all applicable precautions when handling such parts.

3. Engine Operating Limits

A. Exhaust Gas Temperature (EGT), Station 4.95 Harness Average
(1)Maximum allowable observed exhaust gas temperature, at station 4.95 for the applicable operating condition is listed in Table 201.
(Ref. Fig. 209)

OPERATING CONDITION	TIME LIMIT	Max. Harness Average TT4.95 (°C) (Cockpit Reading)
Take-off	5 minutes (See NOTE 1)	625°C (1157°F) (See NOTE 3)
Max. Continuous	Continuous	603°C (1117.4°F) (See NOTE 3)
Starting (On Ground)	-	535°C (995°F)
Starting (In Flight)	-	625°C (1157°F) (See NOTE 2)
Acceleration	-	625°C (1157°F) (See NOTE 2)
Max Reverse	-	625°C (1157°F) (See NOTE 2)

NOTE 1 : The normal 5 minute takeoff time limit may be extended to 10 minutes for an engine out contingency.
NOTE 2 : Limits include EGT shunt of -15°C (5°F) and an additional -4°C (24.8°F) for SB PW4 ENG 73-168 engines and all subsequent engines.
NOTE 3 : Refer to Figure "Overtemperature Limits - Running Condition (minutes) (Sheet 1/2)".

OPERATING CONDITION	TIME LIMIT	Max. Harness Average TT4.95 (°C) (Cockpit Reading)

Maximum Observed EGT
Table 201

(2)EGT (TT4.95 Real as sensed at thermocouples/prior to EEC shunt being applied) Certified Redline limits (°C) :
(a)PW4152 . . 644°C (during ground starting, 535°C)
(b)PW4156A. . 654°C (during ground starting, 535°C)
(c)PW4158 . . 654°C (during ground starting, 535°C)
(3)If EGT (TT4.95) exceeds the redline limits given in table 201 or the values of (Ref. Fig. 209), the engine has been subjected to an over-temperature condition.
Remedial action which must be taken depends on temperature level reached, length of time at temperature and condition at which engine operated at time.
CAUTION : WHEN TT4.95 LIMITS ARE EXCEEDED, UNDER CONDITIONS OTHER THAN SURGE, ENGINE SHOULD NOT BE SHUT DOWN ON AN EMERGENCY BASIS, BUT SHOULD BE COOLED FIVE MINUTES UNLESS IT IS OBVIOUS THAT CONTINUED OPERATION WILL RESULT IN ADDITIONAL ENGINE DAMAGE. REGARDLESS OF HOW THE ENGINE IS SHUT DOWN, IT SHOULD NOT BE RESTARTED UNTIL INSPECTION SHOWS THAT BOTH ENGINE ROTORS WILL ROTATE NORMALLY AND APPROPRIATE OVERTEMPERATURE INSPECTION REQUIREMENTS HAVE BEEN ACCOMPLISHED PER FOLLOWING STEP.
IF OVERTEMPERATURE IS ENCOUNTERED AS A RESULT OF SURGE, ENGINE MUST BE SHUT DOWN PER EMERGENCY SHUTDOWN PROCEDURE DESCRIBED IN PARAGRAPH TITLED, ENGINE SHUTDOWN PROCEDURE - EMERGENCY.

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

3. Engine Operating Limits

A. Exhaust Gas Temperature (EGT), Station 4.95 Harness Average
(1)Maximum allowable observed exhaust gas temperature, at station 4.95 for the applicable operating condition is listed in Table 201.
(Ref. Fig. 210)

OPERATING CONDITION	TIME LIMIT	Max. Harness Average TT4.95 (°C) (Cockpit Reading)
Take-off	5 minutes (See NOTE 1)	650°C (1202°F) (See NOTE 3)
Max. Continuous	Continuous	625°C (1157°F) (See NOTE 3)
Starting (On Ground)	-	535°C (995°F)
Starting (In Flight)	-	650°C (1202°F) (See NOTE 2)
Acceleration	-	650°C (1202°F) (See NOTE 2)
Max Reverse	-	650°C (1202°F) (See NOTE 2)

NOTE 1 : The normal 5 minute takeoff time limit may be extended to 10 minutes for an engine out contingency.

NOTE 2 : Limits include EGT shunt of -15°C (5°F) and an additional -4°C (24.8°F) for SB PW4 ENG 73-168 engines and all subsequent engines.

NOTE 3 : Refer to Figure "Overtemperature Limits - Running Condition (minutes) (Sheet 1/2)".

Maximum Observed EGT
Table 201

(2)EGT (TT4.95 Real as sensed at thermocouples/prior to EEC shunt being applied) Certified Redline limits (°C) :
(a)PW4152 . . 644°C (during ground starting, 535°C)
(b)PW4156A. . 654°C (during ground starting, 535°C)
(c)PW4158 . . 654°C (during ground starting, 535°C)

(3)If EGT (TT4.95) exceeds the redline limits given in table 201 or the (Ref. Fig. 210), engine has been subjected to an over-temperature condition.
Remedial action which must be taken depends on temperature level reached, length of time at temperature and condition at which engine operated at time.

CAUTION : WHEN TT4.95 LIMITS ARE EXCEEDED, UNDER CONDITIONS OTHER THAN SURGE, ENGINE SHOULD NOT BE SHUT DOWN ON AN EMERGENCY BASIS, BUT SHOULD BE COOLED FIVE MINUTES UNLESS IT IS OBVIOUS THAT CONTINUED OPERATION WILL RESULT IN ADDITIONAL ENGINE DAMAGE. REGARDLESS OF HOW THE ENGINE IS SHUT DOWN, IT SHOULD NOT BE RESTARTED UNTIL INSPECTION SHOWS THAT BOTH ENGINE ROTORS WILL ROTATE NORMALLY AND APPROPRIATE OVERTEMPERATURE INSPECTION REQUIREMENTS HAVE BEEN ACCOMPLISHED PER FOLLOWING STEP.
IF OVERTEMPERATURE IS ENCOUNTERED AS A RESULT OF SURGE, ENGINE MUST BE SHUT DOWN PER EMERGENCY SHUTDOWN PROCEDURE DESCRIBED

IN PARAGRAPH TITLED, ENGINE SHUTDOWN PROCEDURE - EMERGENCY.

**ON A/C 101-200,

(4)All overtemperatures exceeding above noted limits must be recorded, including engine serial number, maximum temperature reached and duration. Attempt to determine and to correct the cause of overtemperature and perform a visual inspection.
(Ref. Fig. 209) and obey all necessary EGT overtemperature instructions.

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

(4)All overtemperatures exceeding above noted limits must be recorded, including engine serial number, maximum temperature reached and duration. Attempt to determine and to correct the cause of overtemperature and perform a visual inspection.
(Ref. Fig. 210) and obey all necessary EGT overtemperature instructions.

**ON A/C 101-200,

(5)Perform an engine inspection following overtemperature (Ref. 72-00-00, P. Block 601).
NOTE : Before you do the Overtemperature Inspection, check the EGT indication system for satisfactory operation. Ref. TSM 72-00-40, Figure 131 for High EGT.

B. Overtemperature Limits and Overtemperature Inspection Requirements
(1)(Ref. Fig. 208) has been provided to define overtemperature limits and applicable overtemperature inspection requirements for engine operation during starting.
(2)(Ref. Fig. 209) has been provided to define overtemperature limits (time versus EGT observed) and applicable overtemperature inspection requirements for engine operation other than start.
(3)All overtemperatures exceeding the base line limit of (Ref. Fig. 208, 209) must be recorded, including engine serial number, maximum temperature reached and duration.

C. Continue-In-Service Limit
NOTE : Continue-In-Service Limits may be applied as outlined in (Ref. Fig. 208, 209) including applicable notes provided :
(1)Area defining " continue-in-service limit" is not exceeded.
(2)Borescope inspection (Ref. 72-00-00, P. Block 601) of 1st and 2nd stage turbine blades indicates they are free of damage (cracks, blistering of coating, elongation, etc.) and visual inspection of tailpipe shows no evidence of turbine failure.

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

(2)(Ref. Fig. 210) has been provided to define overtemperature limits (time versus EGT observed) and applicable overtemperature inspection requirements for engine operation other than start.
(3)All overtemperatures exceeding the base line limit of (Ref. Fig. 208, 210) must be recorded, including engine serial number, maximum temperature reached and duration.

C. Continue-In-Service Limit
NOTE : Continue-In-Service Limits may be applied as outlined in (Ref. Fig. 208, 210) including applicable notes provided :
(1)Area defining " continue-in-service limit" is not exceeded.
(2)Borescope inspection (Ref. 72-00-00, P. Block 601) of 1st and 2nd stage turbine blades indicates they are free of damage (cracks, blistering of coating, elongation, etc.) and visual inspection of tailpipe shows no evidence of turbine failure.

**ON A/C 101-200,

Chart Area	No. Of Occurrences	Inspection Requirements
A (See note Below)*	1 - 15	(a) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (b) Perform visual inspection per 72-00-00, P. Block 601, Engine Inspection Following Overtemperature. (c) Correct cause of overtemperature.
	16	(a) Remove Engine. See NOTE**. (b) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (c) Correct cause of overtemperature. (d) Perform metallographic analysis on HPT airfoils.

Chart Area	No. Of Occurrences	Inspection Requirements
B	1 - 7	(a) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (b) Perform visual inspection per 72-00-00, P. Block 601 Engine Inspection Following Overtemperature. (c) Whithin 60 hours perform hot section inspection per 72-00-00, P. Block 601. Engine Inspection Following Overtemperature. (d) Correct cause of overtemperature.
	8	(a) Remove Engine. See NOTE**. (b) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (c) Correct cause of overtemperature. (d) Perform metallographic analysis on HPT airfoils.
C	1	(a) Remove Engine. See NOTE**. (b) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (c) Correct cause of overtemperature. (d) Perform metallographic analysis an HPT airfoils.
D	Any Amount	(a) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (b) Correct cause of overtemperature.

NOTE* : In Chart Area A no action required for a transient overtemperature occurrence up to 650°C (1202°F) not exceeding five seconds duration.

Chart Area	No. Of Occurrences	Inspection Requirements
		NOTE** : It is permissible to FERRY FLY an overtemperature engine back to a maintenance base provided that both a visual inspection and a hot section borescope inspection (Ref. 72-00-00, P. Block 601) reveal no visual damage. Before you remove the engine, do a check of the EGT indication system for satisfactory operation.

Key To (Ref. Fig. 209)

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

Chart Area	No. Of Occurrences	Inspection Requirements
A (See note Below)*	1 - 15	(a) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (b) Perform visual inspection per 72-00-00, P. Block 601, Engine Inspection Following Overtemperature. (c) Correct cause of overtemperature.
	16	(a) Remove Engine. See NOTE**. (b) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (c) Correct cause of overtemperature. (d) Perform metallographic analysis on HPT airfoils.
B	1 - 7	(a) Record : (1) Engine serial no. ; (2) Maximum temperature ;

Chart Area	No. Of Occurrences	Inspection Requirements
		(3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (b) Perform visual inspection per 72-00-00, P. Block 601 Engine Inspection Following Overtemperature. (c) Whithin 60 hours perform hot section inspection per 72-00-00, P. Block 601. Engine Inspection Following Overtemperature. (d) Correct cause of overtemperature.
	8	(a) Remove Engine. See NOTE**. (b) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (c) Correct cause of overtemperature. (d) Perform metallographic analysis on HPT airfoils.
C	1	(a) Remove Engine. See NOTE**. (b) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (c) Correct cause of overtemperature. (d) Perform metallographic analysis an HPT airfoils.
D	Any Amount	(a) Record : (1) Engine serial no. ; (2) Maximum temperature ; (3) Time the EGT was over the limit (Takeoff or Max Continuous limit) (4) Steady-state or surge conditions. (b) Correct cause of overtemperature.

NOTE* : In Chart Area A no action required for a transient overtemperature occurrence up to 660°C (1220°F) not exceeding five seconds duration.

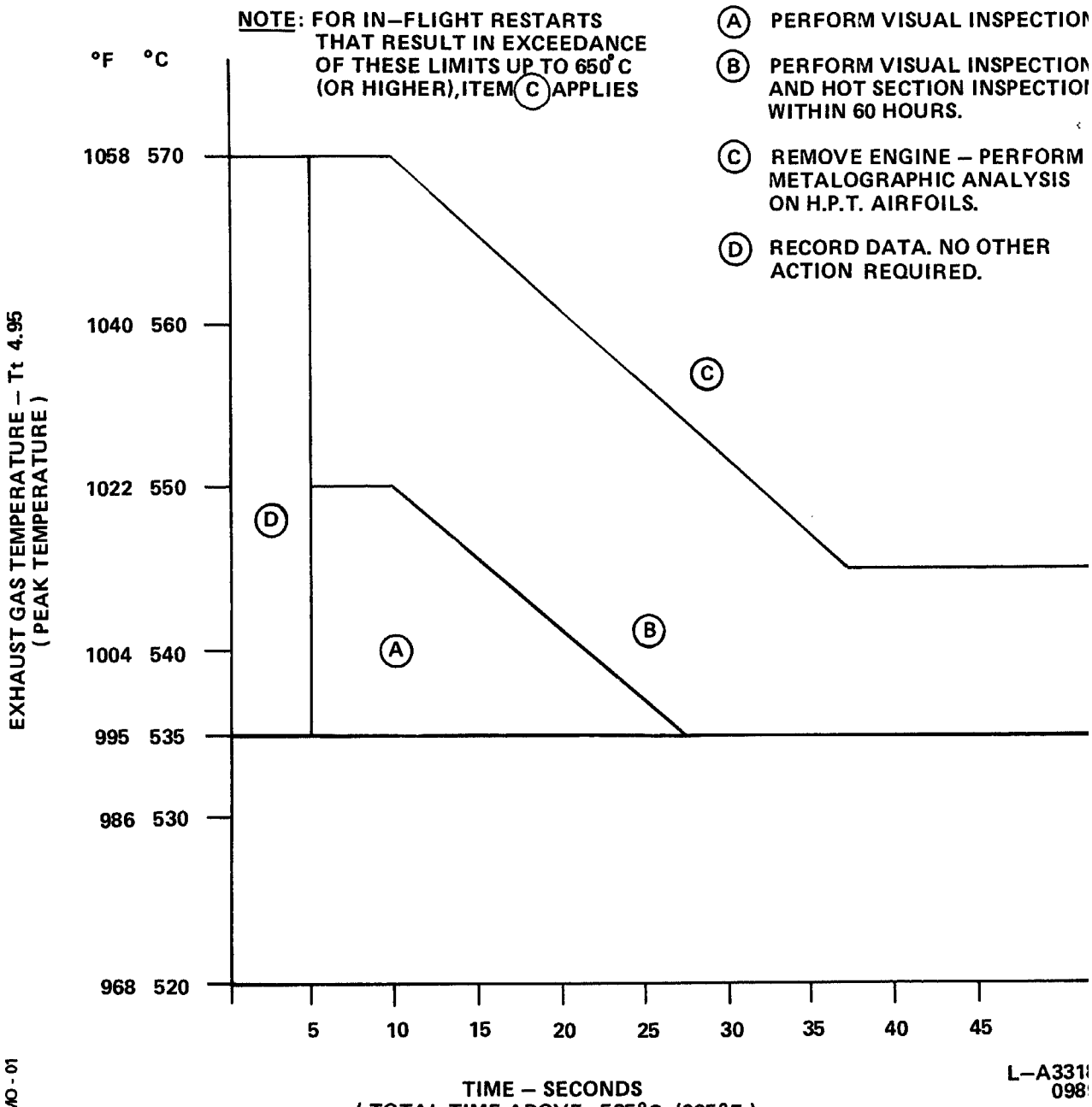
NOTE** : It is permissible to FERRY FLY an overtemperature engine back to a maintenance base provided that both a visual inspection and a hot section borescope inspection (Ref. 72-00-00, P. Block 601) reveal no visual damage.

Chart Area	No. Of Occurrences	Inspection Requirements
		Before you remove the engine, do a check of the EGT indication system for satisfactory operation.

Key To (Ref. Fig. 210)

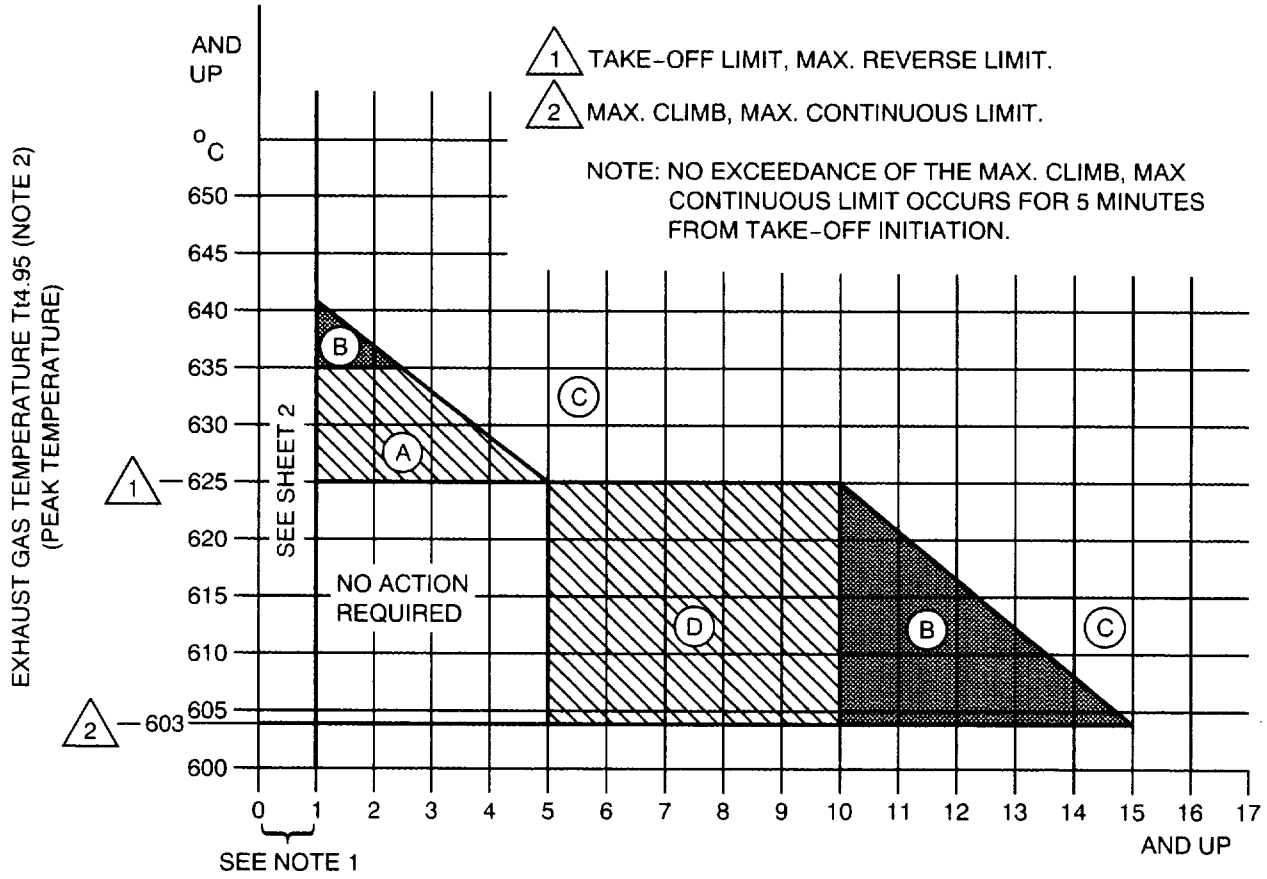
**ON A/C 101-200,

OVERTEMPERATURE LIMITS – STARTING


NOTE: FOR IN–FLIGHT RESTARTS THAT RESULT IN EXCEEDANCE OF THESE LIMITS UP TO 650°C (OR HIGHER), ITEM (C) APPLIES
(A) PERFORM VISUAL INSPECTION
(B) PERFORM VISUAL INSPECTION AND HOT SECTION INSPECTION WITHIN 60 HOURS.
(C) REMOVE ENGINE – PERFORM METALOGRAPHIC ANALYSIS ON H.P.T. AIRFOILS.
(D) RECORD DATA. NO OTHER ACTION REQUIRED.
°F °C
1058 570
1040 560
1022 550
1004 540
995 535
986 530
968 520
EXHAUST GAS TEMPERATURE – Tt 4.95 (PEAK TEMPERATURE)
5 10 15 20 25 30 35 40 45
TIME – SECONDS
(TOTAL TIME ABOVE 535°C (995°F)
(OVERTEMPERATURE LIMITS INCLUDE ENGINE OPERATION BELOW IDLE SPEED)
L–A331
098
BMS 71 00 00 2 KGMO - 01

Overtemperature Limits (Ground and In-Flight Starting, Including Engine Operation Below Idle Speeds)
Figure 208

OVERTEMPERATURE LIMITS - RUNNING CONDITIONS
(MINUTES)



NOTE 1: SEE SHEET 2 DETAIL CHART IF DURATION OF OVERTEMPERATURE IS IN THE 0 TO 60 SECOND RANGE.

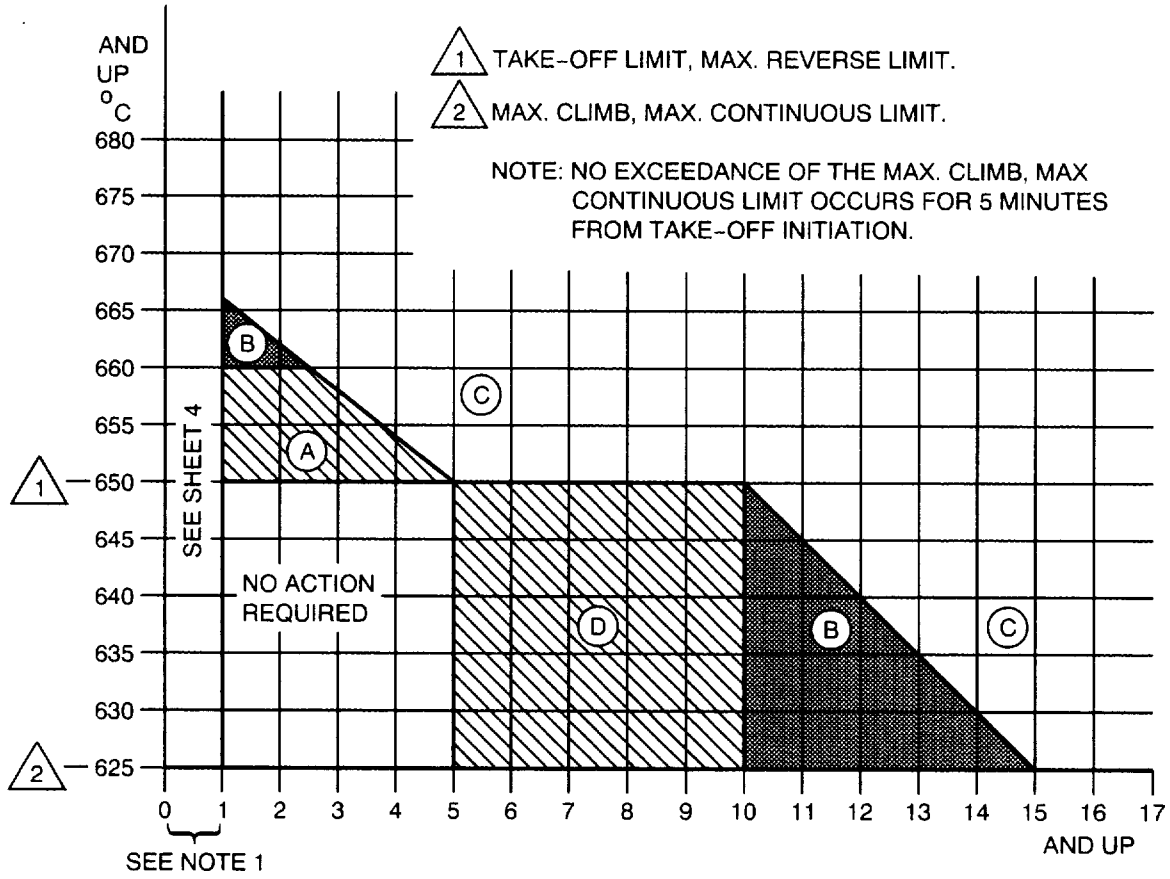
NOTE 2: EEC OUTPUT EGT TEMPERATURE INCLUDES 15°C + 4°C SHUNT. FOR PRE SB PW4ENG 73-168 CONTROLS, ADD 4°C TO TEMPERATURE LIMITS.

L-B7469 (0899)
PW V

BM5 71 00 00 2 KJMA 04

Overtemperature Limits - Running Condition (minutes)
(Sheet 1/2)
Figure 209

OVERTEMPERATURE LIMITS - RUNNING CONDITIONS
(MINUTES)



EXHAUST GAS TEMPERATURE Tt4.95 (NOTE 2)
(PEAK TEMPERATURE)

TIME-MINUTES
DURATION OF OVERTEMPERATURE-MINUTES
(TOTAL TIME ABOVE TAKE-OFF OR MAX CONTINUOUS LIMIT)

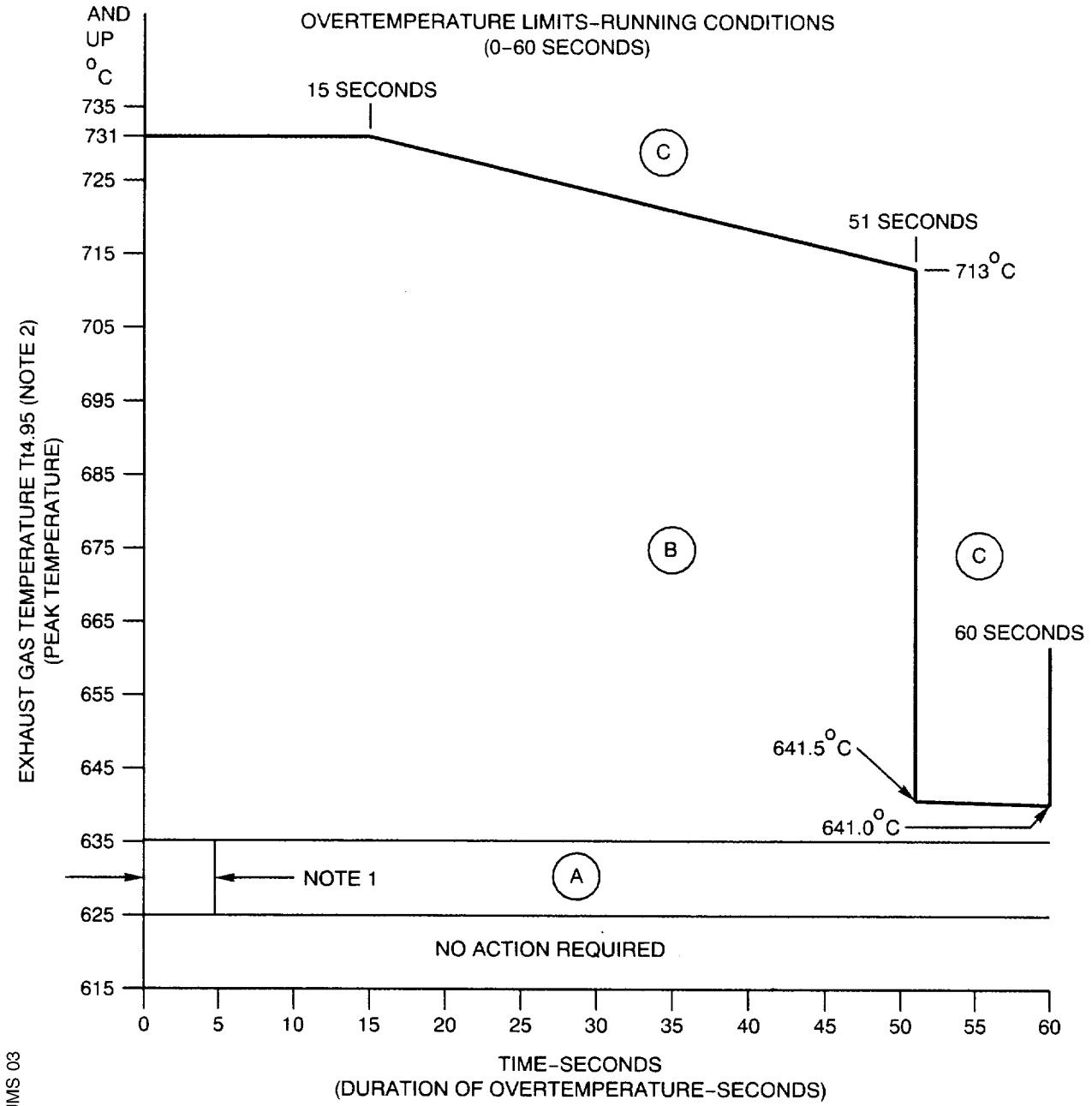
NOTE 1: SEE NEXT SHEET OF THIS FIGURE IF DURATION OF TEMPERATURE IS IN THE 0 TO 60 SECOND RANGE.

NOTE 2: EEC OUTPUT EGT TEMPERATURE INCLUDES 4°C SHUNT. FOR PRE SB PW4ENG 73-168 CONTROLS, ADD 4°C TO TEMPERATURE LIMITS.

L-B7470 (0899)
PW V

BM5 71 00 00 2 KJNA 05

Overtemperature Limits - Running Condition (minutes)
(Sheet 1/2)
Figure 210



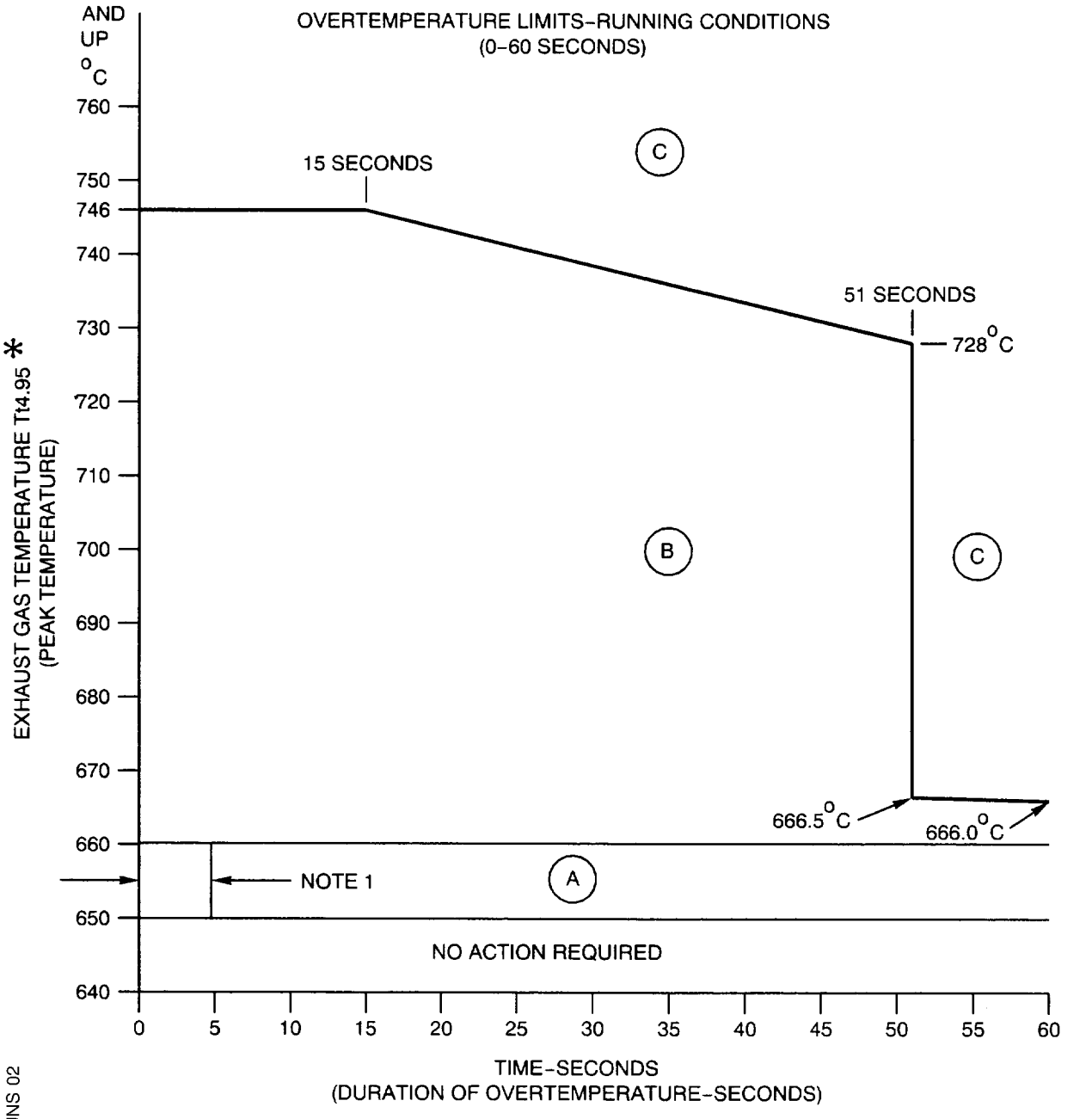
BM5 71 00 00 2 KJMS 03

NOTE 1: NO ACTION REQUIRED FOR A TRANSIENT OVERTEMPERATURE OCCURRENCE UP TO 635°C NOT EXCEEDING FIVE SECONDS DURATION.

NOTE 2: EEC OUTPUT EGT TEMPERATURE INCLUDES 15°C + 4°C SHUNT. FOR PRE SB PW4ENG 73-168 CONTROLS, ADD 4°C TO TEMPERATURE LIMITS.

L-B4819 (0899)
PW V

Overtemperature Limits - Running Condition
(0-60 seconds) (Sheet 2/2)
Figure 209



NOTE 1: NO ACTION REQUIRED FOR A TRANSIENT OVERTEMPERATURE OCCURRENCE UP TO 660°C NOT EXCEEDING FIVE SECONDS DURATION.

* EEC OUTPUT EGT TEMPERATURE INCLUDES 4°C SHUNT. FOR PRE SB PW4ENG 73-168 CONTROLS, ADD 4°C TO TEMPERATURE LIMITS.

L-B5674 (1297)
PW V

BM5 71 00 00 2 KJNS 02

Overtemperature Limits - Running Condition
(0-60 seconds) (Sheet 2/2)
Figure 210

D. Maximum Allowable Operation Speeds
(1)The maximum allowable operating speeds are listed below :
Low pressure rotor, N1--4012 RPM (111.4 percent N1)
High pressure rotor, N2--10.300 RPM (104 percent N2)
NOTE : When overspeed limits are exceeded, the engine should be shut down as soon as possible in a normal manner unless it is obvious that continued operation will result in additional engine damage. The engine should not be restarted until the appropriate overspeed inspection requirements have been accomplished (Ref. 72-00-00, P. Block 601).
(2)All overspeed incidents exceeding the limits noted above must be recorded including the engine serial number, maximum N1 or N2 speed reached and the duration over the N1 or N2 limit, if possible.
(3)Perform engine overspeed inspection (Ref. 72-00-00, P. Block 601).

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

D. Maximum Allowable Operation Speeds
(1)The maximum allowable operating speeds are listed below :
Low pressure rotor, N1--4012 RPM (111.4 percent N1)
High pressure rotor, N2--10.450 RPM (105.5 percent N2)
NOTE : When overspeed limits are exceeded, the engine should be shut down as soon as possible in a normal manner unless it is obvious that continued operation will result in additional engine damage. The engine should not be restarted until the appropriate overspeed inspection requirements have been accomplished (Ref. 72-00-00, P. Block 601).
(2)All overspeed incidents exceeding the limits noted above must be recorded including the engine serial number, maximum N1 or N2 speed reached and the duration over the N1 or N2 limit, if possible.
(3)Perform engine overspeed inspection (Ref. 72-00-00, P. Block 601).

**ON A/C 101-200,

E. Fuel System Limits and Specifications
(1)Normal fuel system indications are :
(a)Normal fuel flow indications at sea level
1 Idle - 1200 pph to 1600 pph
(544 kgph to 725 kgph)
2 Takeoff - 16,000 pph to 22,000 pph
(7257 kgph to 9979 kgph)
NOTE : FUEL FLOW indications out of above ranges should be investigated and any necessary maintenance actions taken.
(b)Inlet pressure to engine fuel pump must be between 20 and 50 psig (1.37 and 3.44 bars).
(2)Fuel system specifications

(a)Fuel must conform to specifications of Service Bulletin 2016.

F. Seal Leakage Limits
(1)Limits
(a)Table 202 lists seal leakage drains provided on engine and indicated maximum drainage expected from each during operation and after shutdown.

Location	Leakage	Limit During Operation	Limit Following Shutdown
. Gearbox Fuel Pump Pad Drain Port (SD2)	Fuel	20 drops/min (60 ml/hr) See NOTE 1 if over limits	(Same)
. Gearbox Fuel Pump Pad Drain Port (SD2)	Oil	6 drops/min (20 ml/hr) See NOTE 2 if over limits	(Same)
. Stator Vane Actuator (SVA) Drain Port (FD17)	Fuel	20 drops/min (60 ml/hr) See NOTE 1 if over limits	(Same)
. 2.5 Bleed Valve Actuator Drain Port (FD19)	Fuel	20 drops/min (60 ml/hr) See NOTE 1 if over limits	(Same)
. (ENGINE) Air/Oil Heat Exchanger Valve Drain Tube (CR09)	Fuel	10 drops/min (30 ml/hr) See NOTE 1 if over limits	(Same)
. (IDG) Air/Oil Heat Exchanger Valve Drain Tube (CR10)	Fuel	10 drops/min (30 ml/hr) See NOTE 1 if over limits	(Same)
. TCC Actuator Drain Port (AP14)	Fuel	10 drops/min (30 ml/hr) See NOTE 1 if over limits	(Same)
. Gearbox Rear Hydraulic Pump Drive Pad Drain Port (SD3)	Oil	6 drops/min (20 ml/hr) See NOTE 2 if over limits	(Same)
. Gearbox Front Hydraulic Pump Drive Pad Drain Port (SD4)	Oil	6 drops/min (20 ml/hr) See NOTE 2 if over limits	(Same)
. Gearbox Starter Drive Pad Drain Port (SD5)	Oil	6 drops/min (20 ml/hr)	(Same)

Location	Leakage	Limit During Operation	Limit Following Shutdown
		See NOTE 2 if over limits	
. Gearbox IDG Drive Pad Drain Port (SD6)	Oil	6 drops/min (20 ml/hr)	(Same)
		See NOTE 2 if over limits	
. Gearbox EEC Alternator Drive Pad Drain Port (SD8)	Oil	6 drops/min (20 ml/hr)	(Same)
		See NOTE 2 if over limits	
. IDG Fuel/Oil Cooler Front Drain Port (AP21)		No Measureable Leakage	
. Engine Fuel/Oil Cooler Front Drain Port (AP24)		No Measureable Leakage	
. Fuel/Oil Cooler Rear Drain Port (AP25)		No Measureable Leakage	
. Fuel/Oil Cooler Bypass Valve Drain Port (AP30)	Oil	10 drops/min (30 ml/hr)	(Same)

NOTE 1 : A one-time flyback limit of 120 drops/min (360 ml/hr) to nearest maintenance base capable of replacing the component is permissible.

NOTE 2 : Oil leakage of 6 drops/min (20 ml/hr) or less is permitted and maintenance is not necessary. Oil leakage can be greater than 6 drops/min (20ml/hr) at one gearbox seal drain. The engine can continue in service to the next layover at a maintenance station if you obey all these conditions :

(a)Oil leakage with the engine operating cannot be more than 30 drops/min (90 ml/hr).

(b)Current oil consumption (not average) is less than 0.3 qt/hr (0.28 liter/hour).

(c)The oil tank is full.

(d)Only one engine is affected.

(e)A deferred item is entered in the log to replace the affected drive seal.

(f)For the deferred period, leakage is checked prior to each departure and consumption is checked after each flight and still meet the limits given above.

Seal Leakage Limits
Table 202

G. Oil System Limits and Specifications

(1)Main oil pressure : 70 psig (4.82 bars) minimum.
(2)Pressure drop across main oil filter :50 psid (3.44 bars) maximum.
(3)Main oil temperature :
(a)325°F (162.8°C) maximum prior to accelerating engine above idle, oil as measured returning during all stabilized running of three minutes or more after engine warm-up.
(b)350°F (176.7°C) maximum during stabilization at MINIMUM IDLE or APPROACH IDLE following any high power running. Do not exceed 20 minutes at or above 325°F (162.8°C). If oil temperatures are exceeded perform oil over-temperature inspection (Ref. 72-00-00, P. Block 601).
(4)Oil specifications
NOTE : Engine must be properly serviced prior to motoring or starting (Ref. 12-13-79, P. Block 1).
(a)Approved oils are listed in latest issue of Service Bulletin 238.
CAUTION : DO NOT MIX DIFFERENT BRANDS OF OIL.
(b)Oil consumption guideline maximum is 0.125 US gal/hr (0.47 liters/hr). A sudden increase or continually increasing trend in oil consumption should be investigated.
NOTE :The oil quantity instrument in the flight compartment indicates the quantity of oil in the oil tank only. It does not include the quantity of oil in the engine. During operation of the engine, oil can go from the oil tank to the engine.
This causes the oil quantity indication to decrease by the same quantity. After the engine shuts down, oil drains from the engine back to the oil tank. As the oil returns to the oil tank, the oil quantity indication in the flight compartment shows an increase in oil quantity.

H. Vibration Guidelines
(1)When N1 (LP Rotor) or N2 (HP Rotor) Vibration (VIB) reaches the Advisory Level given below, the "Engine" message is automatically displayed while the corresponding indication flashes (green) on the ECAM display unit. In this case, the crew must retard engine power to reduce the vibration level and closely monitor the other parameters to detect any engine faults.
(a)N1 (LP Rotor),
VIB Advisory level..... When an ECAM indication of 3 (equivalent to 1.8 ips) is reached "Engine" message is displayed.
(b)N2 (HP Rotor),
VIB Advisory level..... When an ECAM indication of 5 (equivalent to 3.0 ips) is reached "Engine" message is displayed.

R J. High Nacelle Air Temperature Indications
(1)General
(a)Engine operation with hot air leak under nacelle may result in heat damage to components in vicinity of leak. For example, a leak at lower section of "K" flange may affect components behind main gearbox such as FADEC alternator, IDG, starter, and green hydraulic pump. An increase in nacelle air temperature, above level specified

(Ref. Fig. 211), may have an adverse effect on external components.

(2) During ground run operation, check for high nacelle air temperature in accordance with the requirements (Ref. Fig. 211).

NOTE : Temperature level specified (Ref. Fig. 211) is not expected to be reached under normal operating conditions.

(3) If nacelle temperature exceeds level (Ref. Fig. 211) necessary corrective action must be taken. Following conditions are associated with high nacelle air temperature :

(a) Repeated replacement of components.

(b) Obvious heat distress or discoloration of adjacent structures, components, or electrical wiring.

(c) Pressure relief door found open, - indication of a massive air leak.

(d) Inadvertent fire warning due to hot air leaking on a fire detection loop.

4. Prime Engine Oil and Fuel System

NOTE : This procedure should be used whenever engine repair has resulted in oil compartments and/or fuel system being drained.

A. Procedure

(1) Service oil system per oil systems limits and specifications paragraph.

(2) With ignition OFF or grounded, fuel system ON, fuel metering unit condition lever in CUTOFF and thrust lever in IDLE motor engine at speed sufficiently high to ensure oil system is fully primed and oil pump maintains steady pressure.

(3) Move condition lever to RUN at approximately 1500 rpm N2 observed for 30 seconds, then return condition lever to CUTOFF. Dry engine by motoring with condition lever at CUTOFF. Check that no fuel or oil is leaking to outside or into fan ducts.

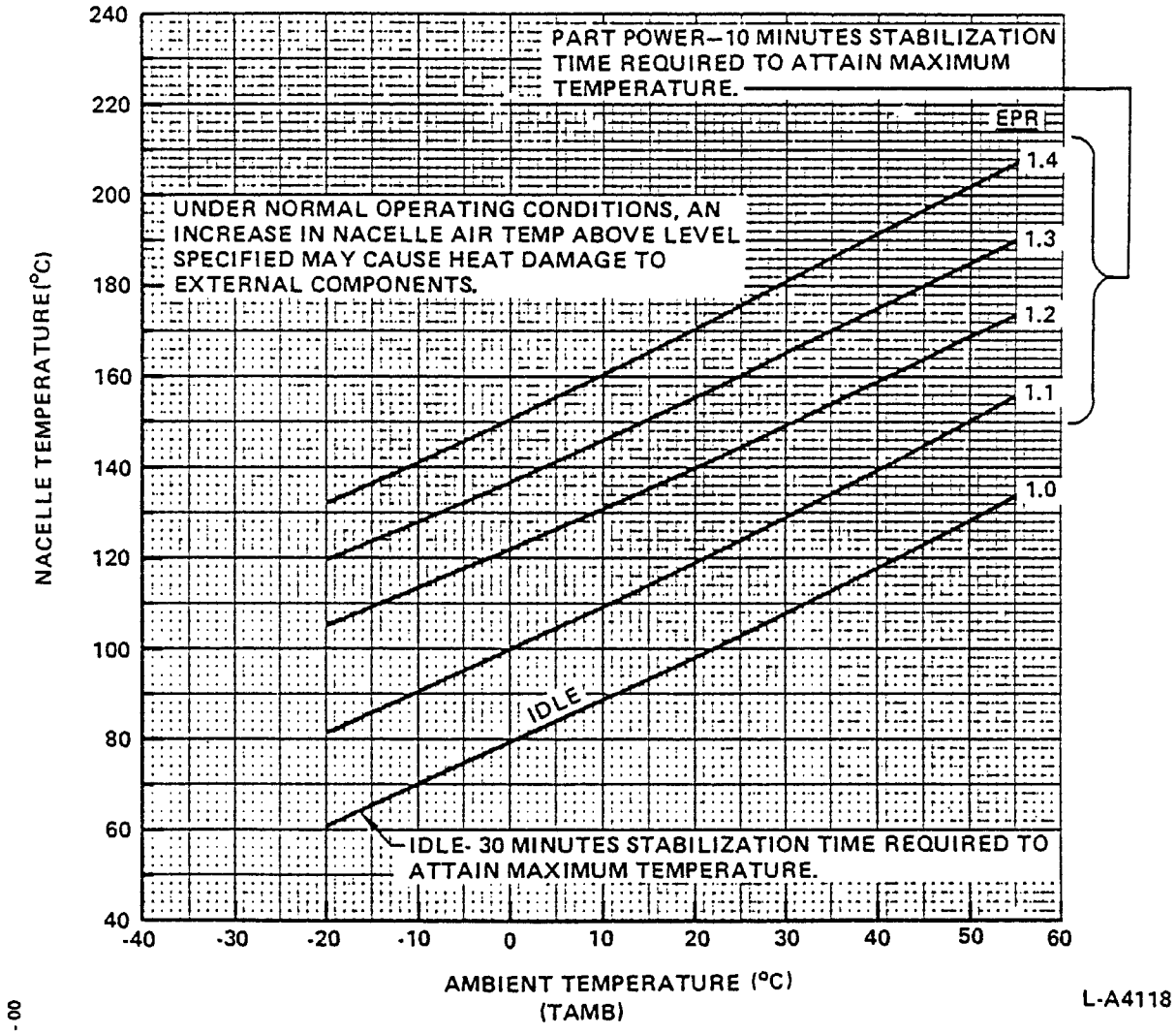
WARNING : A MINIMUM OF FIVE MINUTES SHOULD ELAPSE AFTER ENGINE STOPPAGE BEFORE REMOVING OIL TANK FILLER CAP TO ALLOW TANK PRESSURE TO BLEED OFF.

(4) Check engine oil tank for adequate servicing. If servicing is required (Ref. 12-13-79, P. Block 1).

5. Cold Weather Operating Guidelines

A. In cold weather, the engine should be started with the normal procedure with regard to appropriate note.
During starting in cold temperatures engine start characteristics may change. However, all existing limits and restrictions apply. The time to accelerate to idle may be longer, but the time from fuel on to idle should be less than 120 seconds. The oil filter clog indication may come on during engine warm-up with oil temperature colder than plus 35 deg.C. Maintain the engine at idle until the light/message disappears. Engine oil temperature must be warmer than plus 50 deg.C before takeoff.
Before start-up, if engine oil temperature is minus 40 deg.C or warmer, no pre-heat is required. That engine is certified to use "Type II" oil. Because of the significant increase in viscosity of "Type II" oils, engine pre-heat is required when oil temperature is colder than minus 40 deg.C. Warm air must be blown inside the nacelle by IDGS access door to raise the

MAXIMUM EXPECTED NACELLE TEMPERATURE GUIDE LINES
(GROUND RUN OPERATION)
PW 4152/4156



BM5 71 00 00 2 KLMO - 00

Maximum Expected Nacelle Temperature Guidelines
Figure 211

oil temperature to minus 40 deg.C or warmer.
The necessity for pre-heating the engine can be eliminated with periodic engine runs.
Before oil temperature decreases to colder than minus 40 deg.C, the engine can be started and warmed-up at idle. This warm-up should be repeated as necessary to maintain oil temperature indication at minus 40 deg.C or warmer prior to start-up for dispatch.
Installing engine inlet and exhaust plugs/coverings after shutdown, (Ref. AMM 10-11-00, P. Block 001), will minimize engine heat loss.
To view engine oil temperature indication, make certain that ECAM system is operating (Ref. 31-51-00, P. Block 001) and set the ENGINE page.
It should be noted that when oil temperature is colder than minus 50 deg.C, the indication will appear as XXX.X. To recover the oil temperature indication, the engine must first be pre-heated to raise the oil temperature to warmer than minus 50 deg.C and then the FADEC must be "reset". The FADEC reset can be done by placing the OFF/TEST/BITE DISPLAY switch in the OFF position, and then repositioning the switch back to the TEST position.

B. Prepare the Engine Before Starting in Cold Weather
(1)General
(a)It is usually not necessary to increase the temperature of a jet engine before it is started during cold weather operation. The normal engine starting procedure will usually be adequate. It is possible that heat may be necessary for the conditions that follow :
1 The rotors are locked with ice.
2 Ice and snow is present on the cowling, external surfaces and joints of the thrust reverser.
3 Ice is present on the acoustic panels of the inlet cowl, fan and turbine exhaust ducts.
(2)Procedure
(a)Before starting the engine, make sure the N1 rotor turns freely counter clockwise looking from the front of the engine.
(b)If the N1 rotor will not turn freely, do the following :
1 Install the turbine exhaust cover.
2 Attach the applicable hot air duct from the heater to the engine.
3 Apply heat to the engine gaspath until the N1 rotor turns freely.
(c)Turn the N2 rotor to make sure that N2 rotor turns freely.
(d)If snow or ice holds the fan cowl panels core cowl panels, or thrust reverser closed, apply heat as it is necessary to remove the snow and ice. Remove any melted snow and ice before you open the cowl panels.
(e)If ice has collected on the acoustic panels in the inlet cowl, or the fan and turbine exhaust ducts, apply heat to remove the ice. Remove any melted ice.
(f)If there is ice in the sumps and strainers of the fuel system, apply heat (250°F or 120°C maximum) at the drain area until the water has been removed.

C. Prepare the Engine After Shutdown in Cold Weather
(1)General
(a)Snow and rain can blow into the engine and form ice when the engine is

not in operation. Ice can lock up the rotors to the stators. Ice can also cause rotor system unbalance.

(2)Procedure

(a)When snow or rain occurs and can form ice in the engine, install the inlet and fan exhaust covers as soon as it is possible after engine shutdown.

(b)Install the turbine exhaust cover when the temperature of the engine has decreased sufficiently (usually two to four hours).

6. Engine Starting Procedures (Normal)

WARNING : BOTH N1 AND N2 ROTORS MUST BE AT A COMPLETE STOP PRIOR TO INITIATING THE FOLLOWING PROCEDURE AND POSITIVE COMMUNICATION BETWEEN PERSONNEL INVOLVED IS MANDATORY TO PRECLUDE PERSONAL INJURY.

WARNING : BEFORE STARTING ONE OR BOTH ENGINES, MAKE CERTAIN THAT ALL SAFETY PRECAUTIONS APPLICABLE DURING ENGINE OPERATION HAVE BEEN TAKEN.

WARNING : BEFORE YOU OPERATE THE ENGINES AT POWER SETTINGS ABOVE IDLE, MAKE SURE THAT ACCESS DOOR 136AR IS OPEN. THIS IS TO MAKE SURE THAT THERE IS NO RISK OF RESIDUAL PRESSURE IN THE AIRCRAFT AFTER ENGINE SHUTDOWN.
IF PERSONNEL TRIES TO OPEN A DOOR WHEN THERE IS RESIDUAL PRESSURE IN THE AIRCRAFT :
- THE DOOR CAN OPEN WITH DANGEROUS SUDDEN FORCE
  AND
- THERE IS A RISK OF DEATH OR BAD INJURY AND DAMAGE TO THE AIRCRAFT.

CAUTION : MAKE SURE THAT THERE IS NO HYDRAULIC GROUND POWER SUPPLY CONNECTED TO THE AIRCRAFT WHEN YOU DO THIS PROCEDURE. IF A GROUND POWER SUPPLY IS CONNECTED. THERE IS A RISK OF DAMAGE TO THE ENGINE PUMPS.

NOTE : Confirm that ENG PROBE HEAT switches are selected ON. If not, FADEC CHANNEL A (AND/OR B) FAULT message may be displayed after ENG start.

NOTE : Each of the steps below should be performed in sequence. In the event of an aborted start, the entire starting sequence may have to be repeated from the beginning. During starting, it is acceptable to have bleeds ON but accessory loading should be minimized.

NOTE : If engine does not respond as indicated below, discontinue start and check for unsatisfactory start reasons. If engine has been pressurized and no light, perform clear engine procedure (Dry Motoring) prior to restart.

NOTE : When the aircraft is exposed to a strong tail wind which causes reverse windmilling, it is recommended that the start be monitoring with particular care to prevent a possible hot start. Should starting difficulties attributable to the tail wind become evident, reposition the aircraft facing into the wind.

A. Prestart Conditions

(1)Open access door 136AR and put a warning notice on the door to tell persons that the door must stay open to prevent unwanted pressurization.

NOTE : This is to prevent unwanted pressurization of the aircraft if one or both engines operate at more than idle power.

R (2)Put Chocks in position in front of each forward MLG wheel.
NOTE : If engine start is followed by a high power run, use CHOCK - MLG, ENGINE RUN-UP (98F10103500000).
(3)Make certain that all safety precautions applicable during engine operation have been taken (Ref. 71-00-00, P. Block 501).
(4)Set fuel supply (boost pumps) - ON
(5)Set fuel select switch - CUTOFF
(6)Place IGNITION selector switch in START A or B position.
(7)Make certain that throttle control lever is in idle position.
(8)Make certain that pneumatic supply is on for ground pack source (Ref. Fig. 212).

B. Start Sequence
(1)Press START pushbutton switch.
(2)On START pushbutton switch check that ARM white legend goes off and blue OPEN legend comes on.
NOTE : Stop the start sequence if one of the following conditions is observed :
(a)No rotation - High pressure rotor fails to rotate when starter is pressurized.
(b)Limited rotation - High pressure compressor rotates but is unable to achieve normal rpm.
(3)Check that N2 increases.
(4)Check that oil pressure increases.
(5)At max motoring speed, place HP fuel shut-off valve control lever in ON position.
NOTE : Max motoring speed is assumed when there is no significant increase in N2.
NOTE : 15 % N2 is the minimum acceptable speed for placing the HP fuel shut off valve control lever to ON.
(6)Start the clock.
Light-off should occur within 20 seconds after HP fuel shut-off control lever is placed in ON position. Engine will accelerate to minimum idle speed.
NOTE : When the engines have been cold soaked at OAT's below minus 30°C, up to 30 seconds will be allowed to obtain an increase in EGT provided an increase in N2 is obtained within 20 seconds after HP fuel shut-off valve control lever is placed in ON position.
(7)Check EGT for normal temperature rise and N1 and N2 for normal acceleration. Continue to monitor until EGT peaks, decreases and stabilizes.
(8)Record fuel flow at engine light-off. Fuel flow rate must be between 550 and 650 pph (249 and 295 kg/ph) during normal start.
(9)N1 should be rotating immediately prior to pressurization as observed by N1 RPM indicator.
(10)Increasing oil pressure will be observed.
(11)EGT peak - less than 535°C.
CAUTION : MONITOR BOTH EGT AND N2 CLOSELY DURING START FOR AN IMPENDING HOT START. IF EGT IS CLIMBING RAPIDLY THROUGH 535°C AND N2 ACCELERATION IS SLUGGISH, DISCONTINUE START IMMEDIA-

TELY. CONTINUE TO MOTOR ENGINE UNTIL EGT PEAKS THEN DECREASES.
SHOULD EGT EXCEED STARTING TEMPERATURE OF 535°C DURATION OF OVERTEMPERATURE IN SECONDS AND PEAK TEMPERATURE MUST BE RECORDED.
(Ref. Fig. 208) AND OBEY ALL NECESSARY EGT OVERTEMPERATURE INSPECTION INSTRUCTIONS.
START ATTEMPT SHOULD BE DISCONTINUED IF ANY OF THE FOLLOWING OCCURS :

- NO LIGHT - BURNER DOES NOT LIGHT AS EVIDENCED BY NO RISE IN EXHAUST GAS TEMPERATURE WITHIN 20 SECONDS.
- IMPENDING HOT START - AFTER LIGHT HAS OCCURED, EGT CLIMBS VERY RAPIDLY WITH SLUGGISH OR NO ACCELERATION OF N2.
- SLOW ACCELERATION OR HUNG START - AFTER LIGHT, N2 OR EGT INCREASE VERY SLUGGISHLY (MORE THAN TWO MINUTES TO ACCELERATE TO IDLE) OR STABILIZE BELOW IDLE. AN INDICATION OF N1 ROTAION IS NOT OBTAINED PRIOR TO FUEL PRESSURIZATION.
- IF FUEL OR IGNITION IS INADVERTENTLY INTERRUPTED.
- ABNORMALLY HIGH OR LOW FUEL FLOW.
- INCREASING OIL PRESSURE IS NOT OBSERVED.

NOTE : The start can be aborted by placing the fuel lever in the cut-off position.
After placing the fuel lever in cut-off, maintain starter engagement and continue motoring the engine for 30 seconds to clear out trapped fuel or vapors or until EGT peaks then decreases.
(If starter is already disengaged, re-engage when N2 is at or below 20 percent N2 RPM and motor engine as specified above).
See clear engine procedure-dry motoring.

CAUTION : If start sequence is discontinued after reaching 45 % N2, allow N2 to decrease below 5 % N2 prior to attempting a restart.

NOTE : During all ground test starts, record maximum EGT, maximum fuel flow, and time required to accelerate from pressurize to idle.

(12)When N2 reaches 45 %, check that OPEN legend goes off on START pushbutton switch.

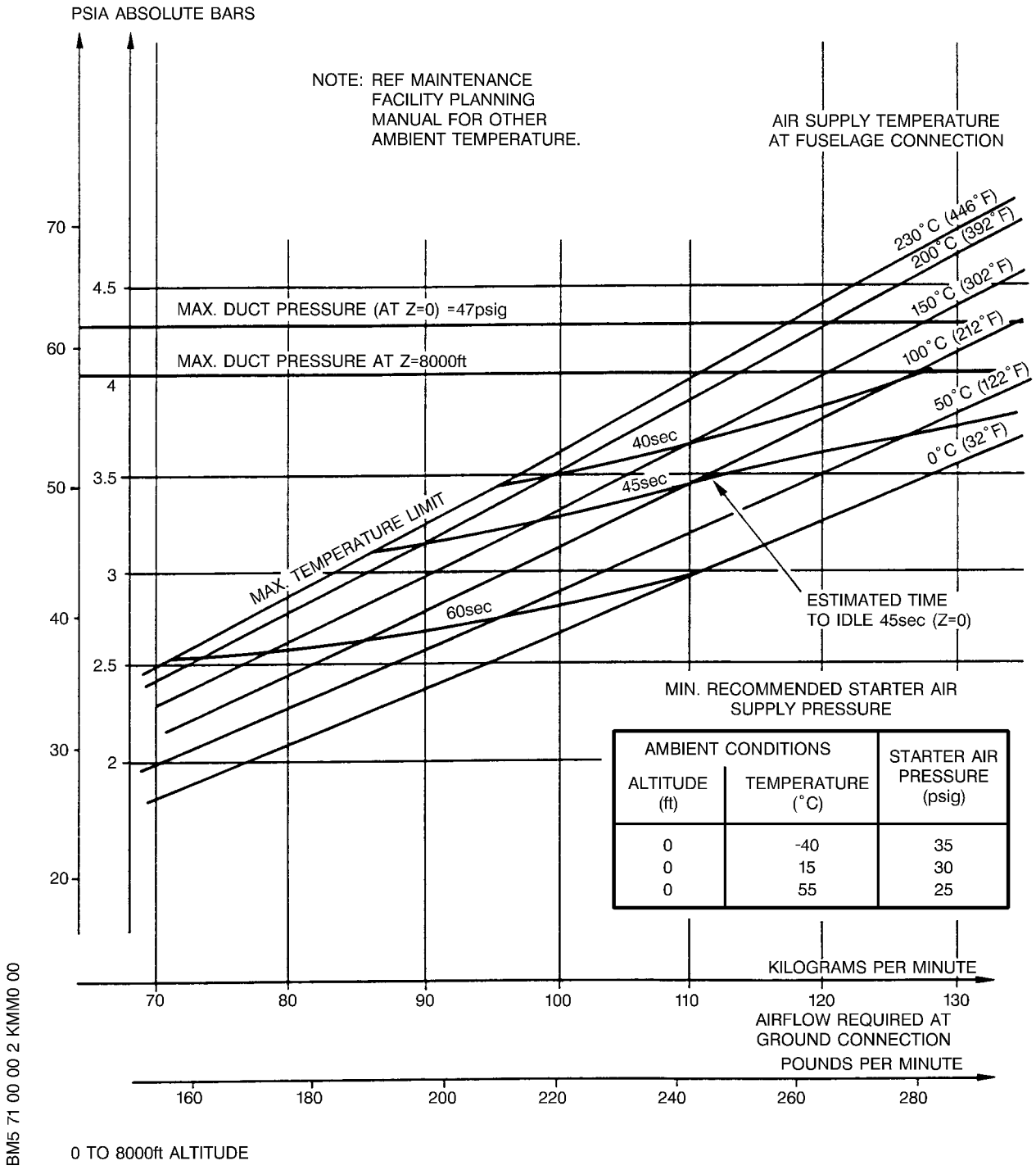
NOTE : Starter valve should be closed before engine reaches idle.

(13)Engine parameters will build to following values at sea level minimum idle conditions : allow engine to stabilize at minimum idle rpm.

PARAMETER	
EPR	1.007 to 1.022
%N2	60.6 to 68.9
%N1	19.2 to 26.8
EGT (DEG C)	210 to 473
FF KG/HR	433 to 780 (see NOTE (4))

OIL TEMPERATURE = +50.0 DEGREES C MINIMUM.
OIL PRESSURE = +70 PSI (482.6 KPa) MINIMUM, ONCE OIL TEMPERATURE MINIMUM IS REACHED.

NOTES : (1) These values are to be used as guideline only. For more info refer to EEC fault messages.



BM5 71 00 00 2 KMM0 00

Engine Starting Pneumatic Requirements
Ambient Temperature: + 15°C (+ 60°F)
Figure 212

(2) If head wind, or tail wind conditions are encountered, N1 will vary beyond the range given in this table.
(3) Table valid from 0 to 10,000 feet except for fuel flow. For each 1000 feet increase in altitude, subtract 31 KGPH from FF.
(4) The conversion factor for fuel flow for PPH to KGPH should be 2.205 PPH = 1KGPH.
(5) Guideline parameter ranges are given for tamb conditions of -25 to +50 Deg. C.

NOTE : The oil quantity instrument in the flight compartment indicates the quantity of oil in the oil tank only. It does not include the quantity of oil in the engine. During operation of the engine, as much as 15 quarts (14.20 cl) of oil can go from the oil tank to the engine.
This causes the oil quantity indication to decrease by the same quantity. After the engine shuts down, oil drains from the engine back to the oil tank, the oil quantity indication in the flight compartment shows an increase in oil quantity.
Engine ignition system should be turned off as soon as successful start is assured and should remain off during all maintenance ground running to minimize possibility of overtemperature in event of compressor surge.

7. Engine Shutdown Procedure

A. Normal
(1)Retard power lever to MINIMUM IDLE position.
CAUTION : DO NOT SHUTDOWN ENGINE WITHOUT ADEQUATE COOLING. TURBINE ROTOR SEIZURE COULD OCCUR.
(2)Allow engine to cool for 5 minutes minimum, at MINIMUM IDLE power lever setting.
NOTE : Whenever engine shutdown is to be made from power settings above MINIMUM IDLE, engine should be run at MINIMUM IDLE for approximately five minutes prior to shutdown. Engine may be restarted per normal starting procedure. See Engine Starting Procedure (Normal).
(3)After observing the cool-down recommendations stated above :
(a)Power lever - MINIMUM IDLE.
(b)Move fuel lever to CUT-OFF position.
1 Check N2, EGT and fuel flow for immediate indication of engine shutdown.
CAUTION : ASCERTAIN THAT AN ENGINE SHUTDOWN OCCURS AS EVIDENCED BY INDICATION OF FUEL SHUT-OFF VALVE CLOSURE. CONTINUED ENGINE OPERATION AFTER PLACING THE FUEL LEVER IN OFF POSITION INDICATES A MALFUNCTION. MAINTENANCE ACTION IS MANDATORY.
2 Check that engine decelerates freely without binding, rubbing, or scraping.
3 During deceleration, observe engine for evidence of internal fire or tailpipe fire. If internal fire or tailpipe fire occurs, perform Clear Engine Procedure per paragraph 7.
(c)Fuel supply - OFF, after high pressure and low pressure rotors spool down to a complete stop.

(d)Confirm ignition switch is in OFF position.
NOTE : Confirm that ENG PROBE HEAT switches are selected OFF.
(e)Remove warning notice and close access door 136AR.

B. Emergency
NOTE : An emergency shutdown is defined as shutdown from power levels above MINIMUM IDLE which, because of surge or other emergency conditions, does not permit conformance to normal shutdown procedure.
(1)Rapidly pull back power lever to MINIMUM IDLE position.
(2)Immediately place fuel selector switch to - CUT-OFF.
(3)Place starter motor switch to ON when N2 RPM drops below 20 percent N2 RPM.
Refer to Clear Engine Procedure to commence dry motoring cool down unless it is evident that further engine damage will occur.
NOTE (a)If engine stall is encountered, motor engine for 30 seconds or motor engine until EGT has been driven below 180°C. For reasons other than surge, motor engine for 30 seconds.
(b)If a tailpipe fire or internal fire is encountered, motor engine to clear out all evidence of fire without regard for starter time limitations. After fire is cleared, complete shutdown, per the normal shutdown procedure.
(c)If the shutdown cause was other than a surge, tailpipe fire, cause requiring a maintenance action, the engine may be restarted within minutes (from the time of shutdown) if the rotors are free and no limits were exceeded. See paragraph on start procedure following emergency shutdown.
(d)This procedure applies equally to abnormal shutdowns caused by inadvertent fuel supply interruption.
NOTE : Confirm that ENG PROBE HEAT switches are selected OFF.

8. Inspection Following Rapid Engine Shutdown

A. Whenever an engine is rapidly shutdown, the ignition system may not be sufficiently cooled. Inspect cables, particularly at the igniter plug terminal, to ensure excessive temperatures did not affect lead insulation, or rubber bushings in a manner which may result in arcing, flashover, and carbon tracking (Ref. 74-00-00, P. Block 601).

9. Engine Start Procedure Following Emergency Shutdown
NOTE : Purpose of this procedure is to minimize damage to turbine blade tip seals if engine is restarted subsequent to an emergency shutdown.

A. If EGT limit has not been exceeded and if both rotors are free :
(1)Restart engine within time period not to exceed 15 minutes from time of shutdown.
(a)Use normal starting procedure previously described except select START/RUN when N2 reaches maximum motoring speed obtainable.
(b)Maintain IDLE speed for minimum of 15 minutes before accelerating to power.

B. If restart cannot be accomplished within 15 minutes, then period of at

least 50 minutes from time of shutdown must be allowed prior to restart attempt. (Attempting restart prior to 50 minute period may damage turbine blade tip seals).

(1)After this 50 minute period, if both rotors are free, motor engine for approximately two minutes to cool.

(2)After waiting for five minutes, motor engine another two minutes and restart. Use normal starting procedure except select START/RUN when N2 reaches maximum motoring speed obtainable.

(3)Maintain IDLE speed for minimum of 15 minutes before accelerating to power.

10.Clear Engine Procedure (Dry Motoring)

NOTE : Engine motoring procedure can be used for any operation requiring engine motoring.

A. This procedure is to be used whenever it becomes necessary to clear engine of trapped fuel or vapors.

(1)Make certain that ENGINES/ENG1&2/START CTL& WARN (1KG) circuit breaker is closed.

(2)On panel 430VU

CAUTION : HP FUEL SHUT OFF VALVE CONTROL LEVER MUST BE IN OFF POSITION BEFORE FUEL BOOST PUMPS ARE TURNED ON.

- press all FUEL/PUMPS pushbutton switches (OFF legend off).

(3)On panel 429VU

(a)Place ENG/IGNITION selector switch in CRANK position.
- White ARM legend on ENG1(2)/START pushbutton switch comes on.
- LH and RH air conditioning packs close.

(b)Press ENG1(2)/START pushbutton switch.
If APU is used, APU rating increases to 101.4% (40712 RPM).
- white ARM legend goes off.
- start valve opens.
- blue OPEN legend comes on.
- starter is engaged.

(4)On panel 437VU
- check that starting air pressure is approximately 30 psi.

NOTE : If start valve fails to open automatically, it can be opened manually, respecting safety area access (Ref. 80-00-00, P. Block 201).

(5)Maintain engine rotation for 30 seconds or in the event of a tailpipe fire, until the fire is extinguished without regard for starter time limitations.

(6)Place ignition selector switch in OFF position.
- ENG1(2)/START pushbutton switch is released and OPEN legend goes off.
- air conditioning packs open.
- start valves close.

(7)On panel 430VU
- release all FUEL/PUMPS pushbutton switches (OFF legend on). (when compressors stop rotating).

11.Starter Duty Cycle Limitations

R A. Duty cycle limits
R - Normal duty cycle is two consecutive aborted start attempts.
R - Engine motoring for 30 seconds is required following an aborted start.
R - After 2 aborted start attempts, a 30-minute starter cooling down period
R must be observed prior to further starter operation.

R B. Re-engagement speed limits
R - Normal re-engagement speed : 15 percent N2.
R - Maximum re-engagement speed : 30 percent N2.

C. Extended starter duty cycles and cooling requirements for engine motoring with fuel and ignition OFF are as follows :
(1)0 - 5 minutes ON - Disengage the starter and allow N2 to go to zero before re-engaging the starter.
(2)5 - 10 minutes ON followed by a 10 minute starter cooling period.
(3)10 - 15 minutes ON followed by a 15 minute starter cooling period.

1. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P15-002	Storage Preservation (Ref. 70-00-00)

2. Procedure

A. Accomplish Nacelle Preservation
(1)Apply peelable coating Material No.P15-002 to exposed aluminum surfaces.
(a)Mask all painted surfaces with barrier material and masking tape.
(b)Before applying the peelable coating, make sure that exposed aluminum surfaces are dry and free of dirt, chips, oil, grease, or any other foreign matter.
(c)Mix, spray, and cure peelable coating in accordance with the manufacturer's instructions. Check the thickness of the dry film coating. The required coating thicknesses is 0.0025 - 0.005 in. (0.0635 - 0.127 mm) thick.

CAUTION : DO NOT PLACE TARPAULIN TYPE COVERS OF CLOTH, PLASTIC, OR RUBBER DIRECTLY ON THE COMPONENT. MOVEMENT OF THE COVER AGAINST THE UNPRIMED OR UNPAINTED ALUMINUM SURFACES CAN CAUSE ABRASION THROUGH THE ANODIZED OR NATURAL OXIDE COATING OF THE COMPONENT. ENTRAPMENT OF MOISTURE FROM RAIN OR CONDENSATION FROM TEMPERATURE VARIATIONS CAN OCCUR BETWEEN THE COVER AND THE ALUMINUM SURFACE AND CAUSE CORROSION.

(2)Install covers and plugs on the engine nacelle.
(3)Periodically inspect protective coating.
(a)Every 7 days the protected aluminum surfaces must be checked for evidence of protective coating deterioration, peeling, or lifting. If the protective coating is damaged, remove entire coating and reapply.
(b)Every 60 days remove the protective coating and check the condition of the aluminum skin. If there is any damage to the aluminum skin, make repairs and reapply protective coating.
(c)Temporary protective coating can be removed by peeling from the component surface. Lift the film at one corner or edge and peel from surface of component.

B. Accomplish Nacelle Depreservation
(1)Remove all peelable coating from exposed aluminum surfaces prior to aircraft engine operation.
(a)Temporary coating can be removed by peeling from the component surface. Lift the film at one corner or edge and peel from surface of component.

1. General

WARNING : BEFORE ATTEMPTING MAINTENANCE OPERATIONS ON THE FUEL SYSTEM MAKE CERTAIN THAT FIRE EXTINGUISHING EQUIPMENT IS READILY AVAILABLE IN PROXIMITY TO WORK AREA.

CHECK THAT LANDING GEAR GROUND SAFETIES INCLUDING WHEEL CHOCKS ARE IN POSITION.

IN ORDER TO AVOID DAMAGE TO LINES, PNEUMATIC DUCTS AND ELECTRICAL CONNECTORS AND TO PREVENT COMTAMINATION BY FOREIGN BODIES, BLANK OFF THE LINES, DUCTS AND CONNECTORS WITH PROTECTIVE CAPS.

WARNING : BEFORE PROCEEDING WITH MAINTENANCE WORK ON OR NEAR MECHANICAL FLIGHT CONTROLS OR PRIMARY FLIGHT CONTROL SURFACES, LANDING GEARS, ASSOCIATED DOORS OR ANY MOVING COMPONENT, MAKE CERTAIN THAT GROUND SAFETIES AND/OR WARNING NOTICES ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROLS.

BEFORE POWER IS SUPPLIED TO THE AIRCRAFT MAKE CERTAIN THAT ELECTRICAL CIRCUITS UPON WHICH WORK IS IN PROGRESS ARE ISOLATED.

BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT HYDRAULIC SYSTEM UNDER MAINTENANCE HAS BEEN ISOLATED.

WARNING : OBSERVE SAFETY PRECAUTIONS WHEN WORKING ON THE HYDRAULIC SYSTEM. LONG EXPOSURE TO HYDRAULIC FLUID CAN CAUSE SKIN DEHYDRATION AND CHAPPING. REF. 29-00-00.

WARNING : MAKE SURE THAT PYLON AFT HOIST FITTINGS ARE IN GOOD CONDITION BEFORE YOU INSTALL AND AFTER YOU REMOVE THE BOOTSTRAP REAR MAIN BEAM.

CAUTION : SIGNIFICANT FLIGHT OPERATIONAL INTERMIX CONCERNS EXIST BETWEEN ENGINES AND THRUST REVERSERS REF. 71-00-10, P. BLOCK 201 PRIOR TO ENGINE INSTALLATION.

CAUTION : CHECK AIRCRAFT STABILITY.
NOTE : Aircraft stability is modified by engine removal.
Check aircraft stability (Ref. 05-57-00, P. Block 001) with one or both engines removed before proceeding further.
NOTE : For Removal/Installation by means of bootstrap device :
This procedure is valid with or without the nose cowl.
For the nose cowl removal/installation (Ref. 71-11-00, P. Block 401).

2. Equipment and Materials

ITEM	DESIGNATION
A.	Containers, Approximately One US Gallon (3.8 l) Capacity, Suitable For Fuel and Hydraulic Fluid
B.	Container, Approximately 5 US Gallon (19 l) Capacity, Suitable For Fuel
C. Material No.P02-001	Hydraulic Fluids (Ref. 70-00-00)
D. Material No.P03-001	Oils (Ref. 70-00-00)
E. Material No.P06-002	Lubricant (Ref. 70-00-00)
F. Material No.P06-013	Lubricant (Ref. 70-00-00)
G. Material No.P06-020	Lubricant (Ref. 70-00-00)
H. Material No. 04-014A	Common Greases (Ref. 20-31-00)
J. Material No. 11-026A	Cleaning Agents (Ref. 20-31-00)
K.	Cotter Pin
L.	Gasket
M.	Packing
N.	Circuit Breaker Safety Clips
P.	Corrosion Resistant Steel Lockwire (MS20995-C32) (Ref. 70-00-00)
Q.	Corrosion Resistant Steel Lockwire (MS20995-C47) (Ref. 70-00-00)
R. 98A71101502000	Fixture - Fan Cowl Doors Hold Open
S. 1197-00-00	Bootstrap
or	
U0787001-500	Bootstrap
T. SMIG277ETT	Trolley - Engine Transportation
or	
SMIG277ETT2	Trolley - Engine Transportation
U. S277CR4000	Adapter - Cradle
or	
TMHEC22-00-00	Adapter - Cradle
or	
SMIG277CR7R4H	Adapter - Cradle (If modified for PW4000)
V. 98A71103250000	Sleeve - Cowl Door Opening Actuator
W.	Warning Notices
X.	Access Platform
Y.	Blanking Plug
Z. 98A71103506003	Chest - Torque Set
AA.SMIG277HP	Hydraulic Positioner
AB.RSE1079	Air Motor Ground Air Supply Hose
AC 98A71103511000	Fixture - Fan Cowl Doors Hold Open
AD.PWA86156	Wrench, Crowfoot

**ON A/C 101-200,

R

Referenced Procedures

ITEM	DESIGNATION
- 05-57-00, P. Block 1	Aircraft Stability
- 12-13-24, P. Block 1	Replenishing - Electrical Power
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 12-13-80, P. Block 1	Starting System
- 21-51-00, P. Block 301	Air Cooling System
- 24-11-00, P. Block 501	IDG System
- 24-25-00, P. Block 501	AC Essential Generation Switching
- 24-41-00, P. Block 301	AC External Power Control
- 28-24-00, P. Block 501	LP Fuel Fire Shut Off Control
- 29-10-00, P. Block 301	Hydraulic System Pressurization
- 29-11-32, P. Block 401	Hydraulic Pumps
- 29-14-00, P. Block 301	Hydraulic Tank Pressurization/Depressurization
- 30-21-00, P. Block 501	Engine Air Intake Ice Protection
- 36-11-00, P. Block 501	Engine Bleed Air Supply System
- 54-51-00, P. Block 601	Pylon Box
- 54-51-85, P. Block 401	Aft Attach Fitting
- 54-51-86, P. Block 401	Aft Attach Fitting Shim
- 70-00-00, P. Block 201	Standard Practices - Engine - General
- 71-00-00, P. Block 501	Power Plant - General
- 71-00-10, P. Block 201	Engine Component Intermix
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-03, P. Block 201	Fan Thrust Reverser Cowl
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl
- 71-13-05, P. Block 501	Fan Cowl Door Latch
- 71-21-00, P. Block 601	Forward Mount
- 71-22-00, P. Block 601	Aft Mount
- 73-38-00, P. Block 501	FADEC System Indicating
- 78-31-00, P. Block 501	Thrust Reverser System Control
- 78-31-01, P. Block 401	Pneumatic Drive Unit
- 78-32-11, P. Block 401	Thrust Reverser Translating Sleeves

**ON A/C 101-200,

3. Procedure

A. Job Set-Up
(1)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).
(2)Make certain that electronics racks ventilation is correct.
(3)On flight compartment overhead panel, pull the appropriate engine fire handle and install a warning notice to prohibit handle actuation to normal (pushed) position while maintenance procedures are in progress.
(4)De-pressurize appropriate hydraulic system (Ref. 29-10-00, P. Block 301) and reservoirs (Ref. 29-14-00, P. Block 301).
(5)De-energize the aircraft electrical network.
NOTE : Aircraft electrical network can stay energized if necessary for maintenance practice.
(6)On panel 133VU, open safety and tag all circuit breakers related to

engines, together with the following ones :

For Engine 1

PANEL	SERVICE	IDENT.	LOCATION
22VU	FUEL/LP VALVES/MOTOR 2/ENG 1	3QG	201/J19
22VU	AIR BLEED/ENG 1/WARN	9HA	203/G15
22VU	AIR BLEED/ENG 1/CONTROLLER/MONITOR	5HA	209/A17
22VU	AIR BLEED/ENG 1/CONTROLLER/CTL	7HA	209/A18
22VU	ENG FIRE DET/ENG 1/LOOP A	1WD	209/A19
22VU	ENG FIRE DET/ENG 1/LOOP B	3WD	209/A20
22VU	ENG FIRE DET/ENG 1/WARN	5WD	209/A21

**ON A/C 101-200,

131VU	AIR BLEED & COMPT TEMP/ENG 1 VALVES/HP	3HA	311/H53
131VU	AIR BLEED & COMPT TEMP/ENG 1 VALVES/BLEED	11HA	311/H54
132VU	ENG ANTI-ICE/VALVE CTL/ENG 1	1DN	321/P65
132VU	FUEL/LP VALVES/ENG 1/POS ANN	5QG	322/N53
132VU	ENG ANTI-ICE/WARN/ENG 1	3DN	322/N70
132VU	FUEL/LP VALVES/ENG 1/MOTOR 1	1QG	323/M53
133VU	HYDRAULIC/ENG 1/PUMP CTL/B	31GJ	331/V57
133VU	HYDRAULIC/ENG 1/PUMP CTL/G	99GK	331/V58
133VU	ENGINES/ENG 1/THRUST REVERSER LOCK	45KM	332/U67

**ON A/C 101-200,

For Engine 2

PANEL	SERVICE	IDENT.	LOCATION
22VU	FUEL/LP VALVES/MOTOR 2/ENG 2	4QG	201/J20
22VU	ENG FIRE DET/ENG 2/WARN	6WD	209/A22
22VU	ENG FIRE DET/ENG 2/LOOP B	4WD	209/A23
22VU	ENG FIRE DET/ENG 2/LOOP A	2WD	209/A24

**ON A/C 101-200,

131VU	AIR BLEED & COMPT TEMP/ENG 2/VALVES/BLEED	12HA	311/H55
131VU	AIR BLEED & COMPT TEMP/ENG 2/VALVES/HP	4HA	312/G53
131VU	AIR BLEED & COMPT TEMP/ENG 2/WARN	10HA	312/G54
131VU	AIR BLEED & COMPT TEMP/ENG 2 CONTROLLER/CTL	8HA	315/D53
131VU	AIR BLEED & COMPT TEMP/ENG 2 CONTROLLER/	6HA	315/D54

PANEL	SERVICE	IDENT.	LOCATION
	MONITOR		
132VU	ENG ANTI-ICE/VALVE CTL/ENG 2	2DN	321/P66
132VU	FUEL/LP VALVES/ENG 2/MOTOR 1	2QG	322/N54
132VU	ENG ANTI-ICE/WARN/ENG 2	28DN	322/N71
132VU	FUEL/LP VALVES/ENG 2/POS ANN	6QG	323/M54
133VU	HYDRAULIC/ENG 2/PUMP CTL/Y	1GD	332/U57
133VU	HYDRAULIC/ENG 2/PUMP CTL/G	100GK	332/U58
133VU	ENGINES/ENG2/THRUST REVERSER LOCK	44KM	331/V75

**ON A/C 101-200,

For Engines 1 and 2

PANEL	SERVICE	IDENT.	LOCATION
21VU	AFS/TCC/SYS 1/28VDC	306CJ1	102/H 8
21VU	AFS/TCC/SYS 1/115VAC	308CJ1	102/H 9
21VU	AFS/TCC/SENSORS	305CJ1	102/H10
21VU	AIDS/DFDR	7TU	105/E 2
21VU	AIDS/DFDAU	55TU	105/E 3
21VU	AIDS/EXP	54TU	105/E 4
21VU	AIDS/PMUX & SENSORS	12TU	105/E 5
21VU	ECAM/DISPLAYS TEST & CTL PNL LT	12WT	108/B 1
21VU	ECAM/DISPLAY UNIT/L	7WT	108/B 2
21VU	ECAM/DISPLAY UNIT/R	8WT	108/B 3
21VU	ECAM/SGU/1	11WT1	108/B 4
21VU	ECAM/SGU/2	11WT2	108/B 5
21VU	ECAM/FLT WARN/MONITOR	4WW	108/B 6
21VU	ECAM/FLT WARN MONITOR	24WW	108/B 7
21VU	ECAM/FWC 1	7WW	108/B 8
21VU	NAVIGATION/GPWS/CMPTR	6WZ	108/B11
21VU	NAVIGATION/GPWS/WARN	7WZ	108/B12
21VU	ELEC/CBMS REAR PANEL	10WY	108/B13
21VU	ECAM/SDAC/26VAC/NORM 1	3WV1	109/A 2
21VU	ECAM/SDAC/26VAC/NORM 2	3WV2	109/A 3
21VU	ECAM/SDAC/26VAC/ESS 3	5WV	109/A 4
21VU	ECAM/SDAC/PWR SUPPLY	6WV	109/A 5
21VU	ECAM/STICK SHAKER/CAPT	12FU1	109/A 9
21VU	ECAM/STICK SHAKER/F/O	12FU2	109/A10
22VU	ELEC/DISC/IDG 1	3XT	206/D20
22VU	ELEC/DISC/IDG 2	4XT	206/D21
22VU	FIRE EXTING/ENG 1 & 2/SQUIB B/BTL 1	5WE	207/C19
22VU	FIRE EXTING/ENG 1 & 2/SQUIB B/BTL 2	7WE	207/C20
22VU	EPR/ENG 1	1EG	207/C15
22VU	EPR/ENG 2	2EG	207/C16
133VU	ENG 1 AND 2 FIRE EXTING SQUIB A BTL 1	1WE	335/R71
133VU	ENG 1 AND 2 FIRE EXTING SQUIB A BTL 2	3WE	335/R72

PANEL	SERVICE	IDENT.	LOCATION
133VU	HYDRAULIC/ELEC PUMP WARN	4GE	331/V60
133VU	ELEC/GEN 2/GCU/BACK UP SUPPLY	18XU	331/V81
133VU	HYDRAULIC/PTU CTL/G/B	1GL	332/U59
133VU	HYDRAULIC/PTU CTL/G/Y	6GL	332/U60
133VU	HYDRAULIC/ENG PUMP WARN	5GD	333/T57
133VU	HYDRAULIC/ENG 1 & 2/FIRE VALVES	101GK	334/S57
133VU	HYDRAULIC/ENG 1 & 2/FIRE VALVES	103GK	334/S58

(7) On panel 436VU :
  (a) Make certain that the APU Bleed Load Valve Control Switch (17HV) is in OFF position and install a warning notice to tell persons not to use it.
  (b) Make certain that the X BLEED VALVE Control Switch (5HV) is in CLOSE position and install a warning notice to tell persons not to use it.

(8) Make certain that there is a warning notice installed on the HP ground connector to tell persons not to use it.

(9) Open fan cowl doors of the appropriate engine (Ref. 71-13-00, P. Block 301). Support doors with suitable hold open fixture.

(10) Disconnect thrust reverser sense hoses from unions in brackets at top of fan case. Install protective covers on hoses and unions. (Ref. Fig. 404).

(11) Open thrust reverser (Ref. 71-13-00, P. Block 301) and install tool 98A71103250000 (Ref. Fig. 401).

(12) Install access platform.

WARNING : AVOID SPILLAGE OF FUEL AND/OR HYDRAULIC FLUID ONTO ENGINE CASES WHEN DISCONNECTING HOSES AT PYLON INTERFACE. ACCUMULATION OF FUEL AND OIL ON ENGINE AND NACELLE PARTS IS A FIRE HAZARD. CORROSIVE EFFECT OF HYDRAULIC FLUID WILL DAMAGE ENGINE PARTS. ANY SPILLAGE MUST BE REMOVED IMMEDIATELY.

(13) Drain engine fuel pump residual fuel as follows : (Ref. Fig. 403)
  (a) Position suitable container under fuel pump filter drain plug located in the FP1 fuel inlet port to receive approximately five gallons (18.93 L) of fuel.
  (b) Remove lockwire and fuel drain plug and allow all fuel to drain into container.
  (c) Remove fuel container from maintenance area.
  (d) Remove and discard packing from fuel drain plug.
  (e) Apply Lubricant (Material No.P06-002), to new packing and install on fuel drain plug.
  (f) Reinstall fuel drain plug into fuel pump FP1 fuel inlet port and TORQUE to between 35 and 45 lbf.in. (0.40 - 0.50 mdaN). Wirelock drain plug using corrosion-resistant stainless steel wire MS20995C32.

(14) Disconnect fire extinguisher hose from the pylon interface fitting. Install protective caps and plugs. (Ref. Fig. 402)

(15) Disconnect electrical connectors D4967P, D4963P, D4970P, D4966P, D4953P and D4989P from right forward pylon junction box (Ref. Fig. 405) and disconnect electrical connectors D5019P, D4987P and D5008P from brackets. (Ref. Fig. 408) Install protective covers on connectors and receptacles.

Remove clamp (1) from bracket on engine (Ref. Fig. 409).

(16)Disconnect electrical connectors D4998P, D4999P, W2P14 and W1P14 from left forward pylon junction box (Ref. Fig. 405) and disconnect electrical connectors D5003P, D5018P and D4986P from bracket and left thrust reverser junction box (Ref. Fig. 410). Install protective covers on connectors and receptacles. Remove clamps (1) from brackets on engine (Ref. Fig. 410).

(17)Remove grounding strips attaching nose cowl to right and left pylon junction boxes.

(18)Disconnect electrical connectors D4958P, D4956P, D4952P, D4954P, D4971P, and D4961P from pylon electrical connector panel and install protective covers on connectors and receptacles.

NOTE : If an electronics rack ventilation at high speed is necessary for other maintenance practice, proceed as follows :
- Open, safety and tag circuit breaker 1ES(2ES)
- Disconnect connector D4956P
- Install a shunt between pins E and F of receptacle 1853VC (1854VC)
- Remove safety clip and tag and close circuit breaker 1ES(2ES).

(19)Disconnect the two pieces IDG wire harness.

(a)Disconnect main power cable electrical connector D4955P from pylon receptacle and install protective cap on electrical connector and receptacles.

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

(15)On right engine side, disconnect the following electrical connectors :

(a)Disconnect electrical connectors D4967P, D4963P, D4970P, D4966P, D4953P and D4989P from right forward pylon junction box (Ref. Fig. 406).

(b)Disconnect electrical connectors D5019P, D4987P and D5008P from brackets (Ref. Fig. 408). Install protective covers on connectors and receptacles.

(c)Remove clamp (1) from bracket on engine (Ref. Fig. 409).

(d)On the thrust reverser, disconnect electrical connector D5054P and place protective covers on electrical connectors and receptacles. Remove string tie attaching 21W4068 harness to other harness (Ref. Fig. 407).

(16)On left engine side, disconnect the following electrical connectors :

(a)Disconnect electrical connectors D4998P, D4999P, W2P14 and W1P14 from left forward pylon junction box (Ref. Fig. 406) and disconnect electrical connectors D5003P, D5018P and D4986P from bracket and left thrust reverser junction box (Ref. Fig. 410). Install protective covers on connectors and receptacles. Remove clamps (1) from brackets on engine (Ref. Fig. 410).

(b)On the thrust reverser, disconnect electrical connector D5055P and place protective covers on electrical connectors and receptacles. Remove string tie attaching 21W4068 harness to other harness (Ref. Fig. 407).

(17)Remove grounding strips attaching nose cowl to right and left pylon junction boxes.

(18)Disconnect electrical connectors D4958P, D4956P, D4952P, D4954P, D4971P, and D4961P from pylon electrical connector panel and install protective covers on connectors and receptacles.

NOTE : If an electronics rack ventilation at high speed is necessary for other maintenance practice, proceed as follows :
- Open, safety and tag circuit breaker 1ES(2ES)
- Disconnect connector D4956P
- Install a shunt between pins E and F of receptacle 1853VC (1854VC)
- Remove safety clip and tag and close circuit breaker 1ES(2ES).

(19)Disconnect and stow the one piece IDG wire harness (Ref. Fig. 411).

(a)Remove the terminal cover and the attaching hardware (1) from the IDG.

(b)Remove the four nuts (2) and washers or the four captive nuts/washers (2) attaching the wires to the IDG terminal studs and remove the wire from studs.

(c)Remove the bolt (3) and nut attaching the clamp to bracket (4) then remove the two bolts (5) and nuts attaching the bracket (4), and the guide to the engine bracket. Retain the bracket (4).

(d)Remove the bolt, the washers and the nut (6) attaching the two wires 070001-00N and 070002-00N to the engine bracket.

(e)Open the five quick disconnect clamps (7) and remove the IDG harness from the clamps.

(f)Stow the harness onto the brackets (1) and (2) on the left thrust reverser cowl door (Ref. Fig. 416).

**ON A/C 101-200,

(20)Position suitable container under pylon disconnects to catch residual fluid as hoses are disconnected.

WARNING : AVOID SPILLAGE OF FUEL AND/OR HYDRAULIC FLUID ONTO ENGINE CASES WHEN DISCONNECTING HOSES AT PYLON INTERFACE. ACCUMULATION OF FUEL AND OIL ON ENGINE AND NACELLE PARTS IS A FIRE HAZARD. CORROSIVE EFFECT OF HYDRAULIC FLUID WILL DAMAGE ENGINE PARTS. ANY SPILLAGE MUST BE REMOVED IMMEDIATELY.

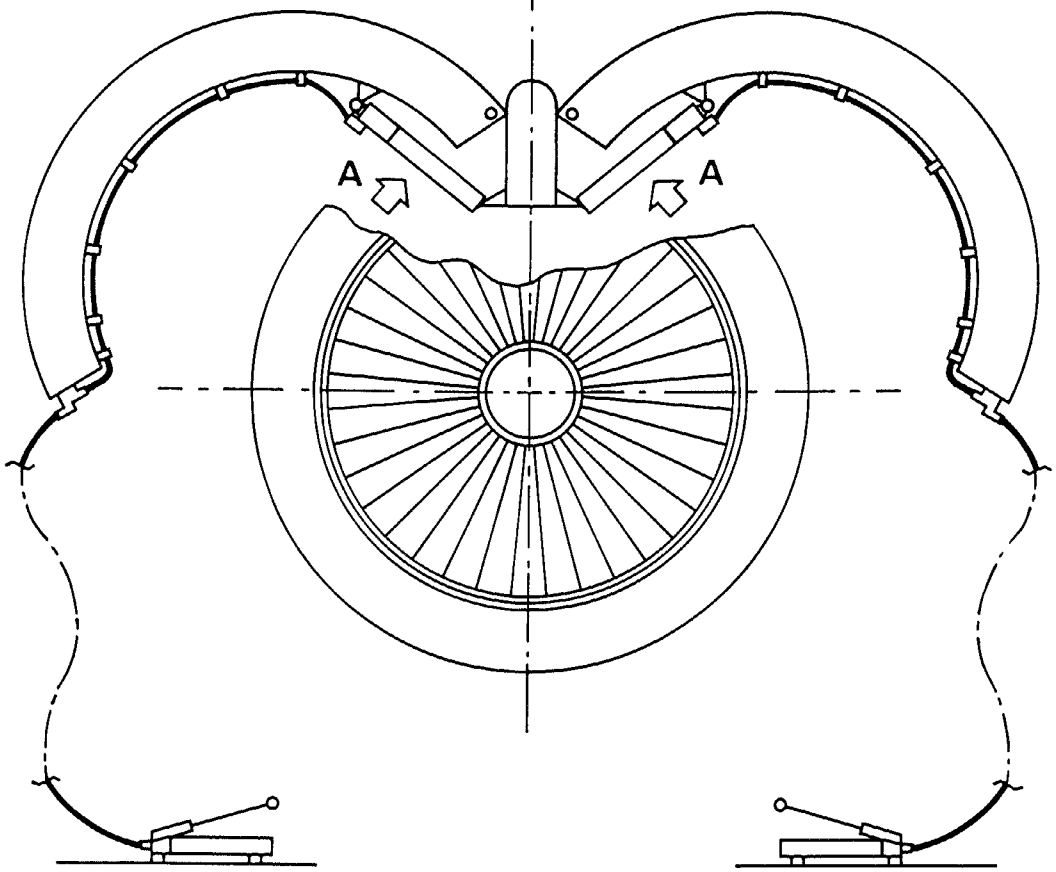
CAUTION : AS HYDRAULIC PUMP PRESSURE AND CASE DRAIN HOSES ARE DISCONNECTED AT PYLON/ENGINE HYDRAULIC INTERFACE, IT IS TO BE NOTED THAT A SMALL AMOUNT OF FLUID MAY FLOW FROM PYLON SIDE. MAKE CERTAIN THAT FLOW STOPS RAPIDELY. IF THIS IS NOT THE CASE, CHECK VALVE SHOULD BE SUSPECTED AND REPLACED.

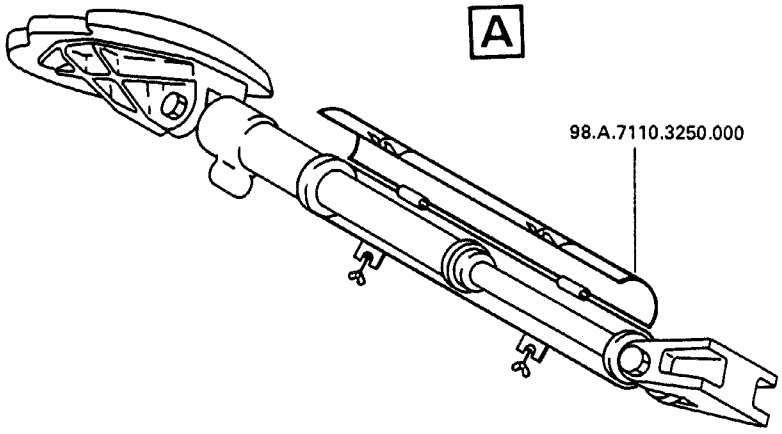
(21)Disconnect hydraulic pump case drain hoses, hydraulic pump pressure hoses, and hydraulic suction hoses at pylon interface box, right side, and install protective caps on hoses and interface box fittings. Use PWA86156 wrench to remove hydraulic pressure and suction hoses.

(Ref. Fig. 412)
(22)Remove main fuel supply hose (Ref. 73-12-04, P. Block 401).
(23)Loosen screws attaching thrust reverser flexible shafts to left and right side of splitter gearbox on top of fan case.
Rotate ends of flexible shafts from under screw heads and disconnect shafts from splitter gearbox (Ref. Fig. 413)
(24)Disconnect nacelle core compartment cooling pneumatic tube.
(a)On thrust reverser door, disconnect coupling nut of hose (2) from elbow (1) (Ref. Fig. 414). Install protective covers.
(25)Remove cotter pins, washers, and clevis pins attaching left and right forward circumferential latch strap to upper center strap attached to top of engine fan case. Install clevis pins, washers, and cotter pins in left and right strap clevises after detachment from center strap.
(26)Disconnect coupling attaching bleed air duct assembly to pylon bleed air duct and install protective covers on ducts (Ref. Fig. 415)
(27)Disconnect sense hose from pneumatic pressure regulating valve and install protective covers on hose and valve port.
(28)Disconnect pylon drain hose from pylon fitting, right side, and install protective covers on hose and pylon fitting.
(29)Disconnect pressure sense hoses from pylon junction box fittings and install protective covers on hoses and junction box fittings.
(30)Disconnect pressure sense hose from fan air valve and install protective covers on hose and valve port.
(31)On engine 1 only, disconnect hydraulic pressurization line restrictor from port on 15th stage (Ref. Fig. 415) and cap open ends at port and restrictor.

**ON A/C 101-200,

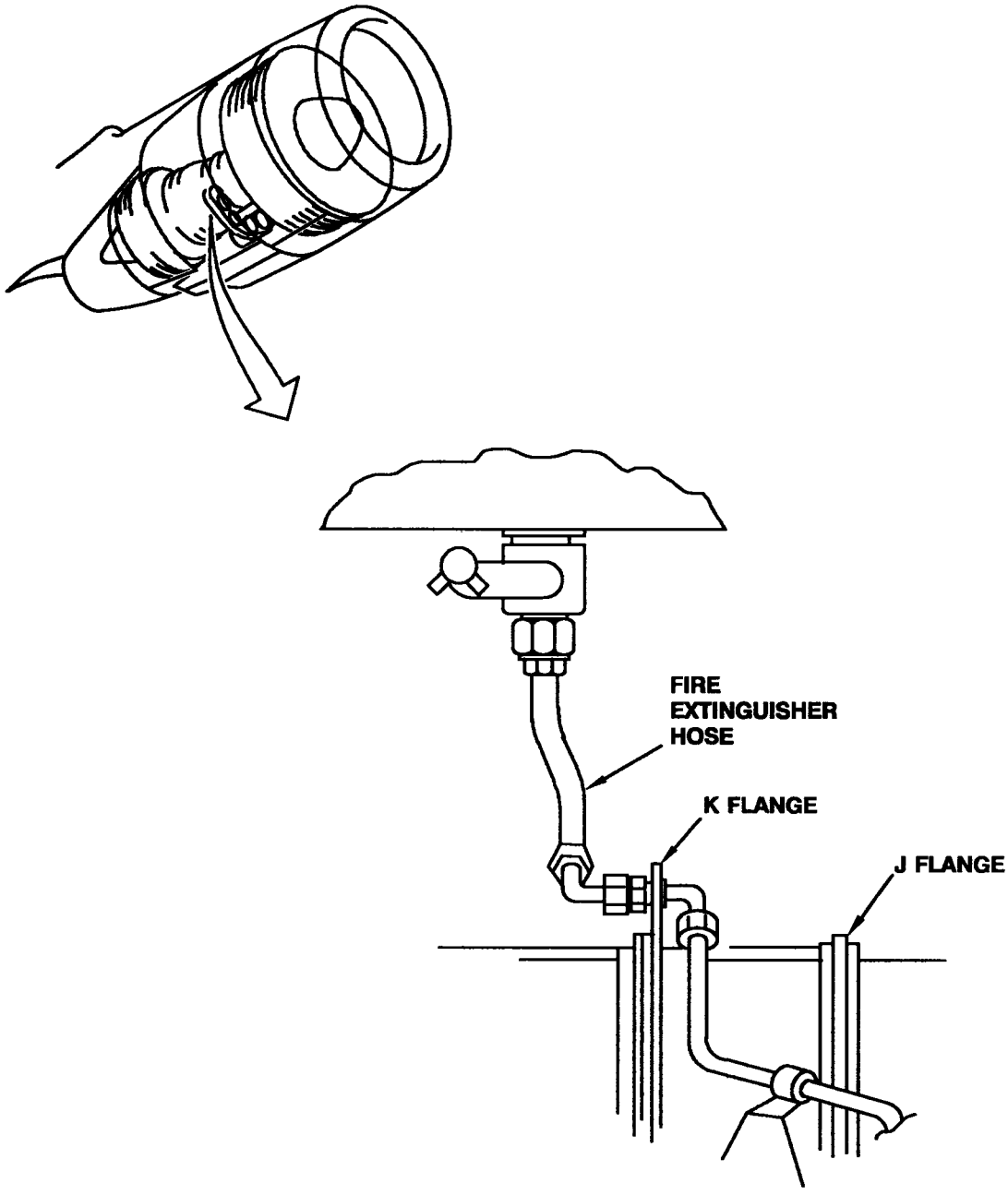
B. Removal by Means of Bootstrap Device
(Ref. Fig. 417, 418, 419)
(Ref. Fig. 420, 421)
WARNING : - MAKE SURE THAT DURING ENGINE LOWERING PROCEDURE THE STIRRUPS OF REAR BEAM CABLE DO NOT JAM IN THE PULLEYS.
FOR THIS PURPOSE MAKE CERTAIN THAT CABLE LENGTH IS EQUAL ON EITHER SIDE OF THE BOOTSTRAP.
- VALUES ON DYNAMOMETERS MUST BE CLOSELY MONITORED.
- IN CASE OF JAMMING OF THE STIRRUPS OF REAR BEAM CABLE IN THE PULLEYS, OVERLOADS CAN BE APPLIED ON THE PYLON AFT HOIST FITTINGS WITH A POSSIBLE FAILURE AT TOOLING ATTACHMENTS WHICH COULD LEAD TO THE ENGINE FALL WITH AS A POSSIBLE CONSEQUENCE SERIOUS INJURY TO PERSONNEL.
- IF OVERLOADS ARE APPLIED AS A PREVENTIVE MEASURE PYLON AFT HOIST FITTINGS AND BOLTS MUST BE SYSTEMATICALLY REPLACED.
(1)Install front bootstrap as follows : (Ref. Fig. 417)
(a)Install support channel (1) on forward attach fitting (9) using plate (2) and bolts (3).
(b)Install retainer (4) and secure with nut and washer (5).
(c)Position bootstrap beam (6) in channel (1) to align attachment holes, and secure with two bolts (7) and wing nuts (8).





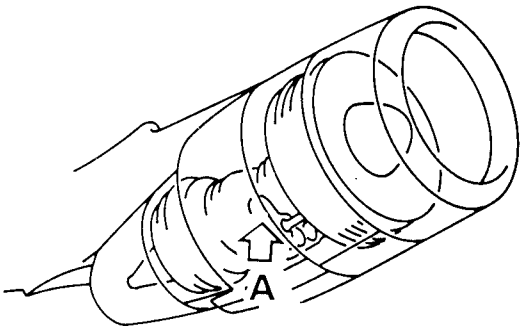
BM5 71 00 00 4 KAMO 21

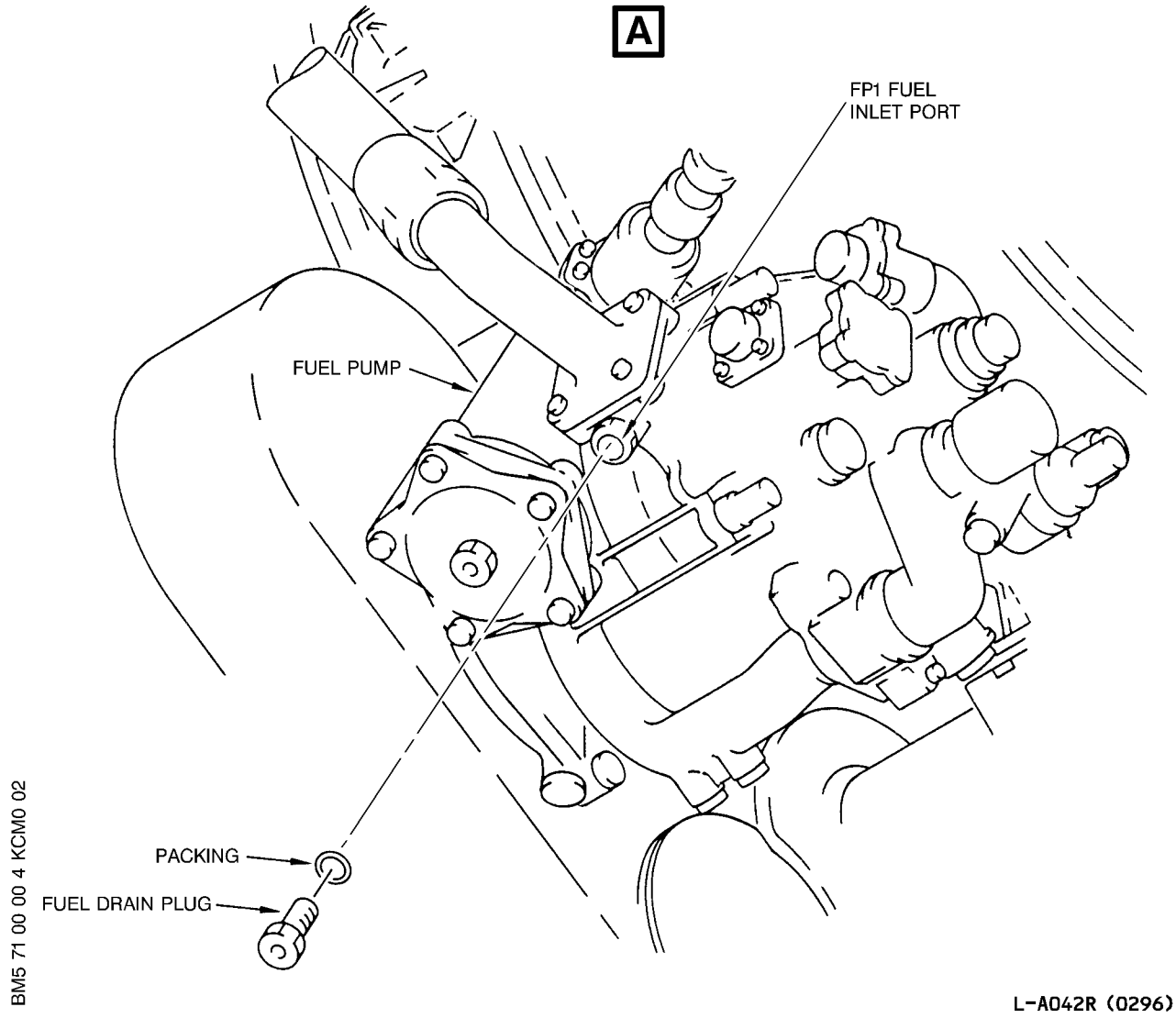
Thrust Reverser Door Hold Open Fixture
Figure 401



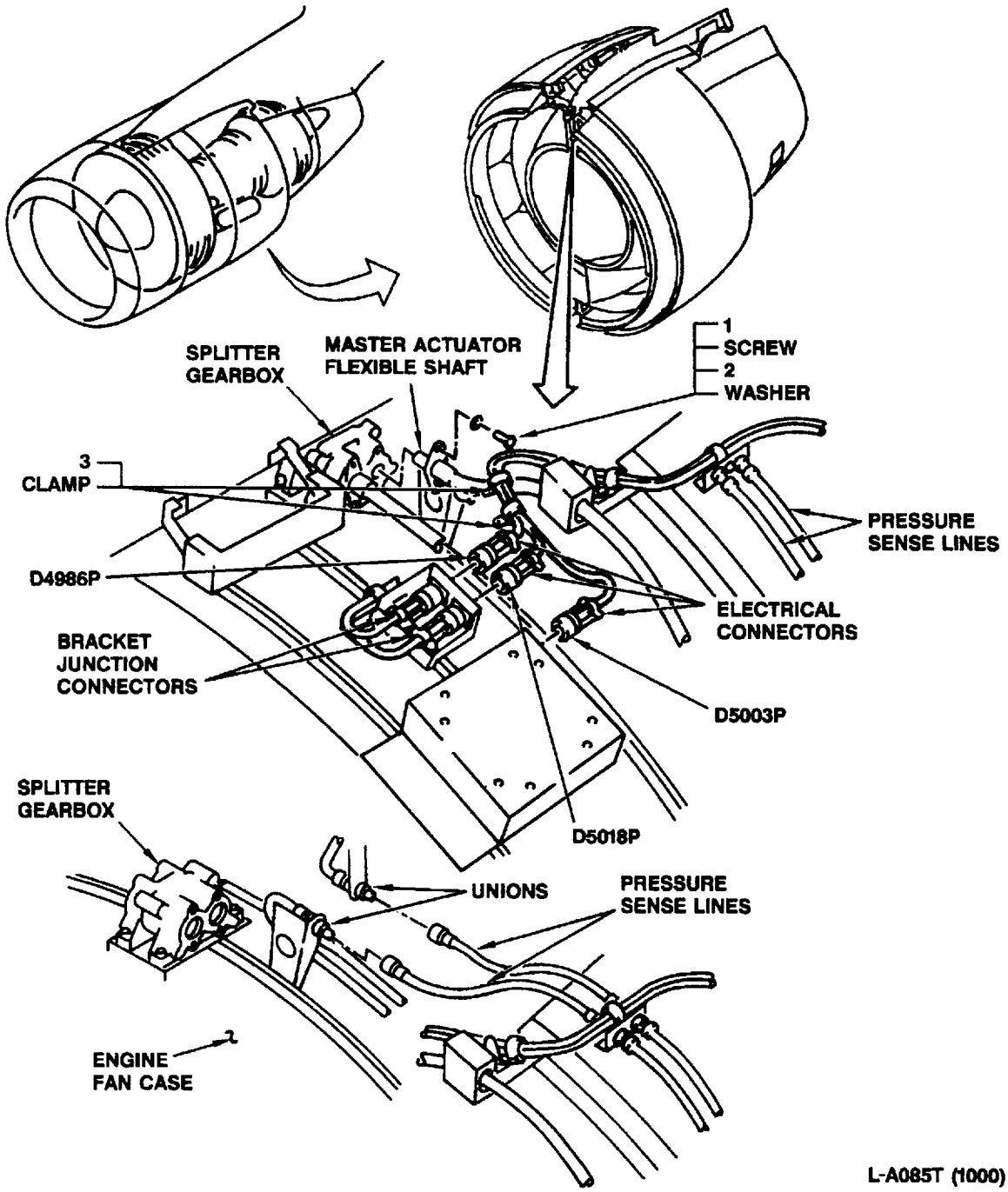
BM5 71 00 00 4 KBM0 00

Fire Extinguisher Hose
Figure 402



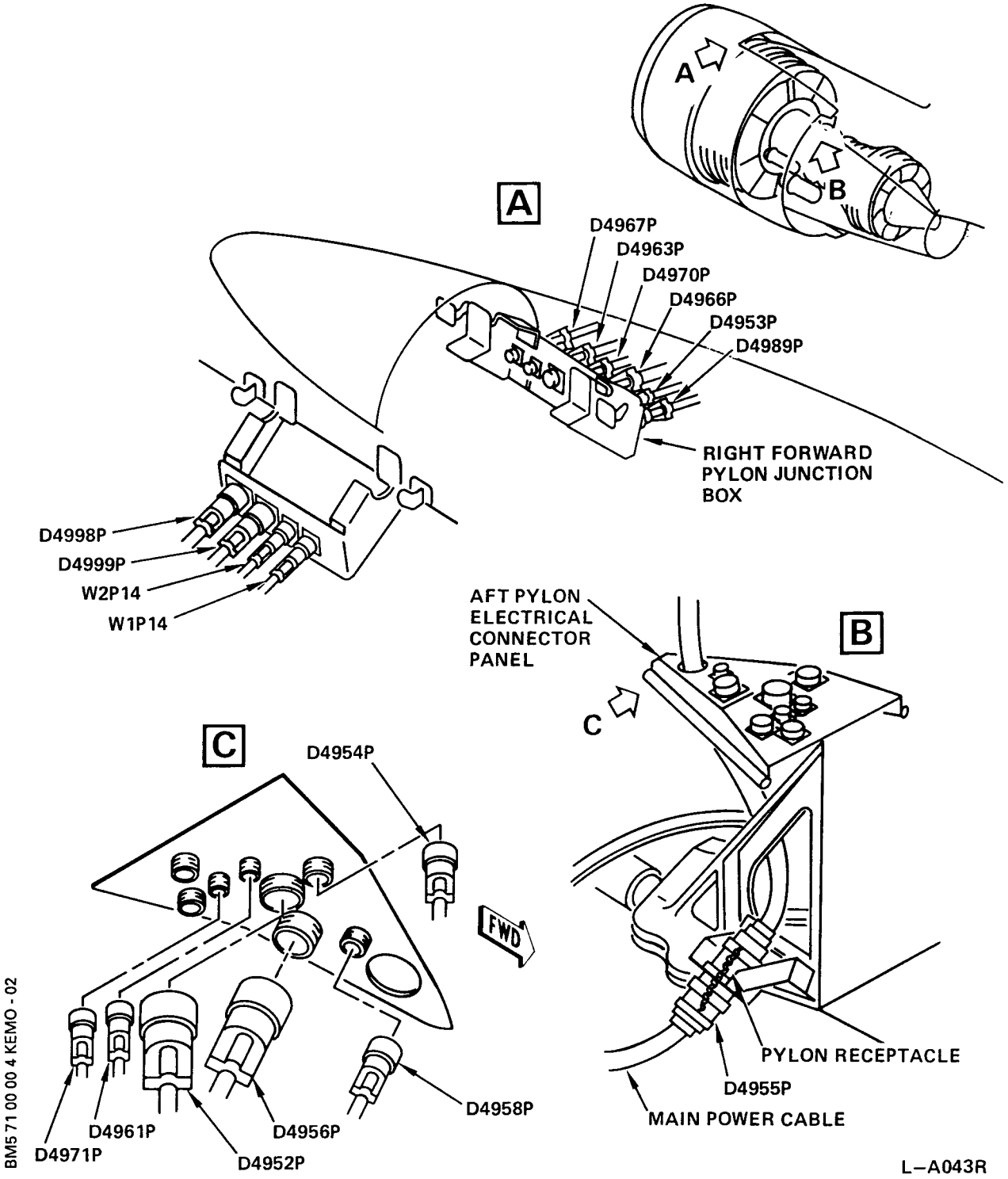


Fuel Drain Port
Figure 403

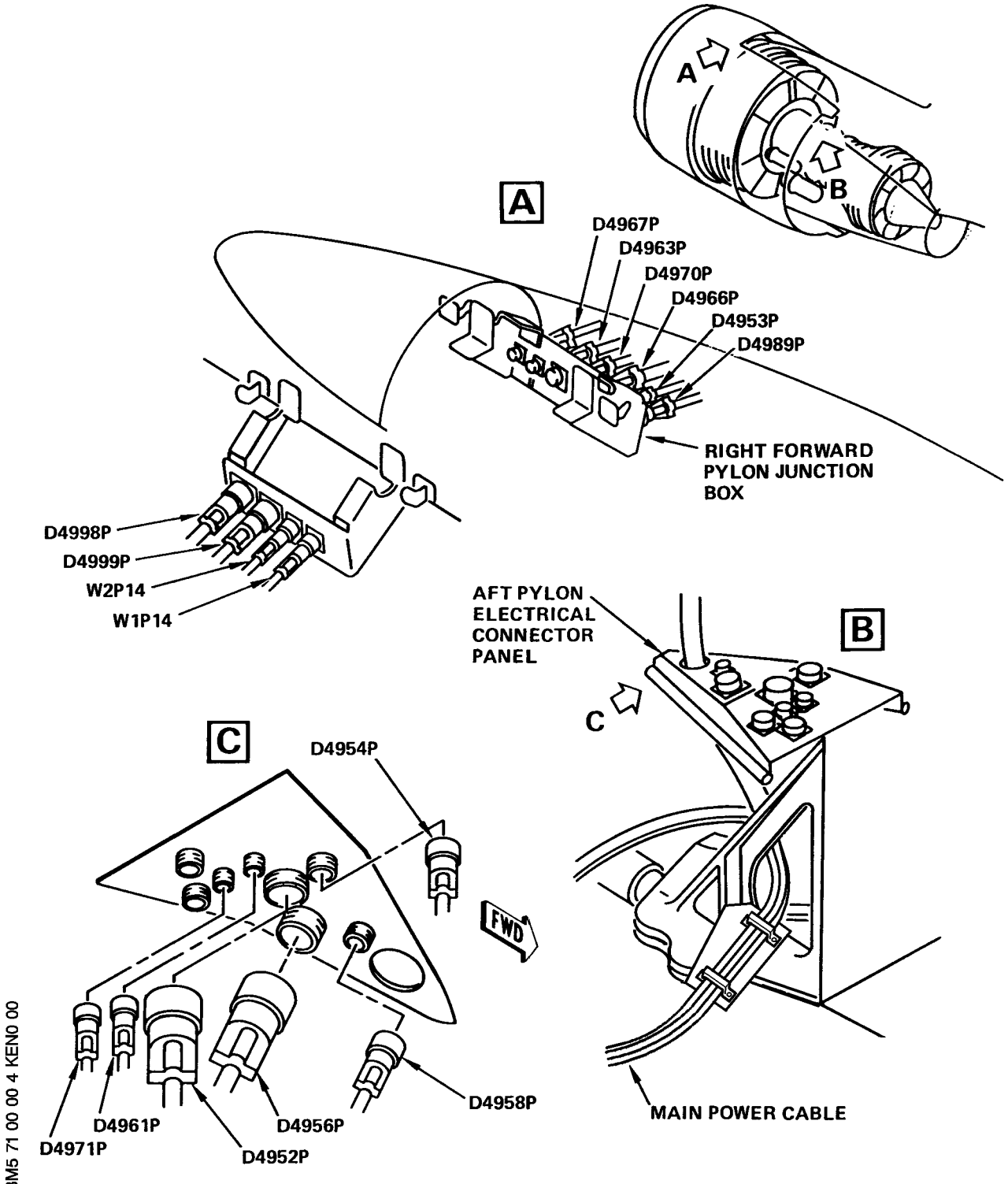


BM5 71 00 00 4 KQM0 00

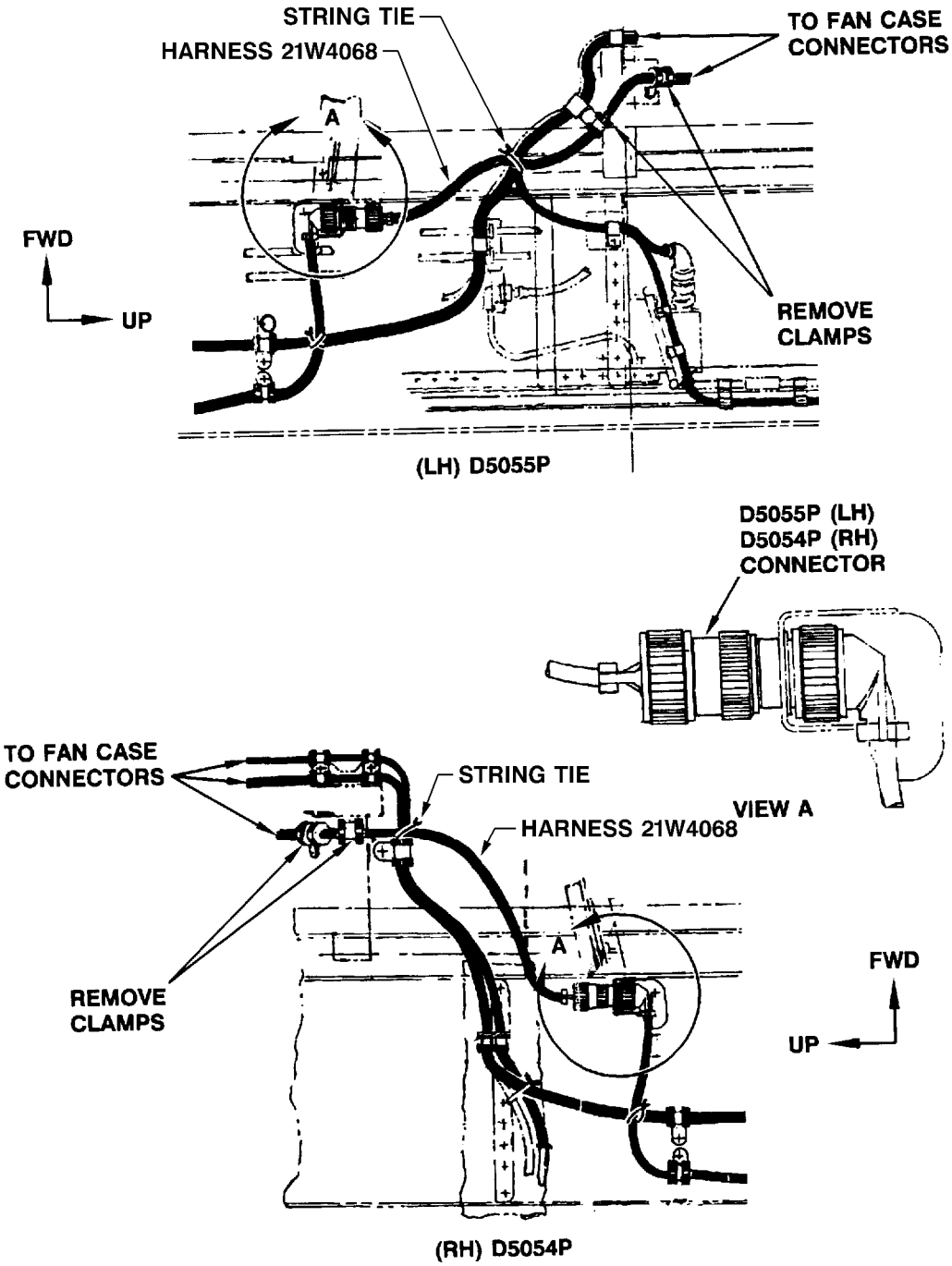
Fan Thrust Reverser Door - Connections at Pylon
Figure 404



Electrical Connectors - Pylon Interface
Figure 405

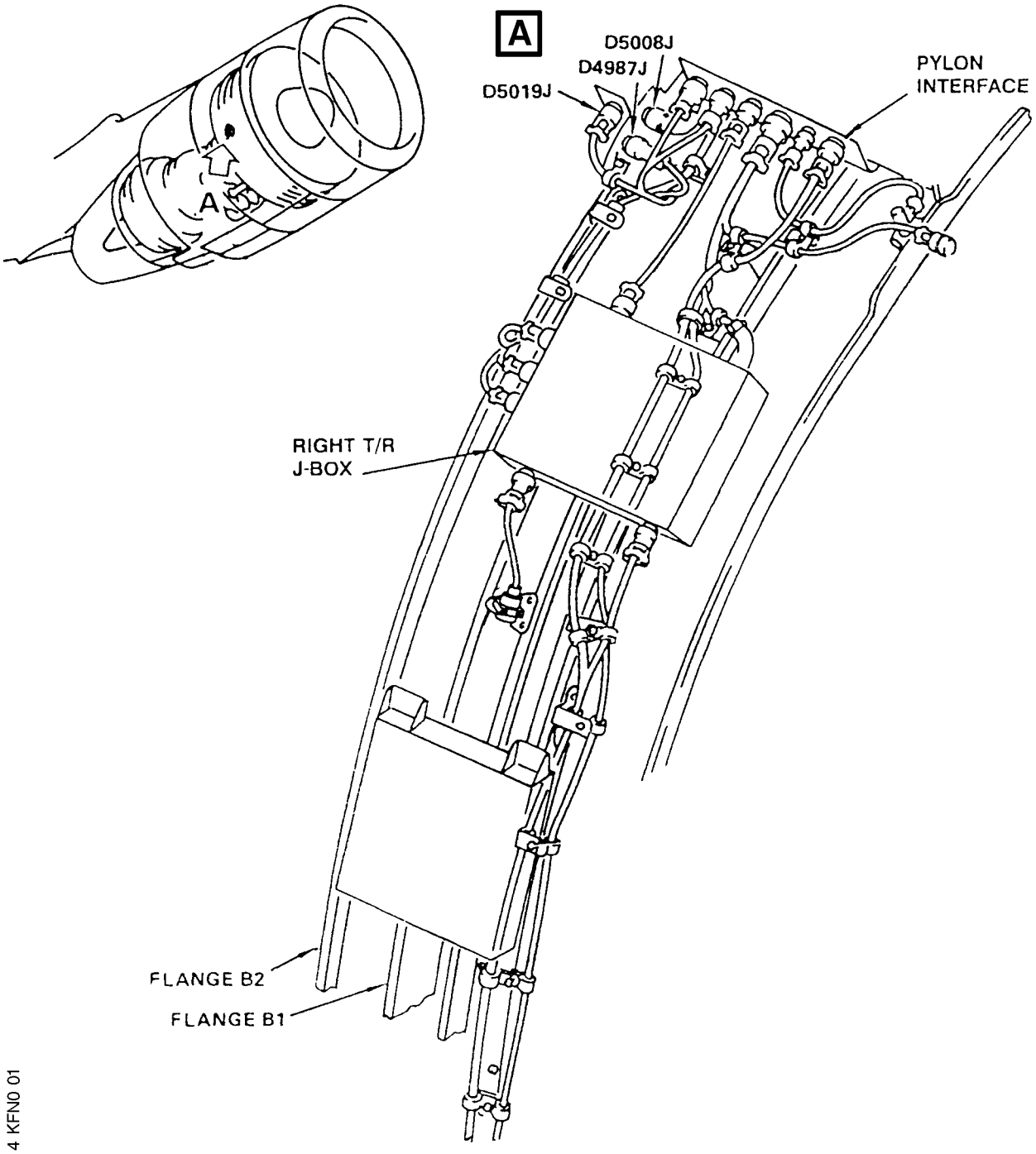


Electrical Connectors - Pylon Interface
Figure 406



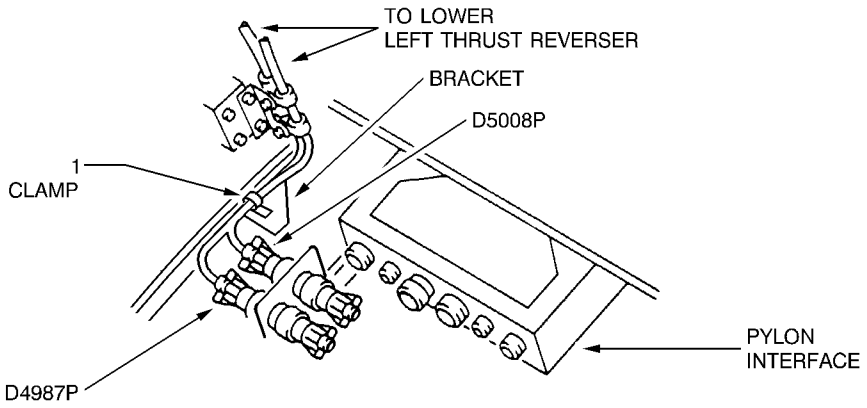
BM5 71 00 00 4 KHT0 00

Thrust Reverser Doors Connection
Figure 407



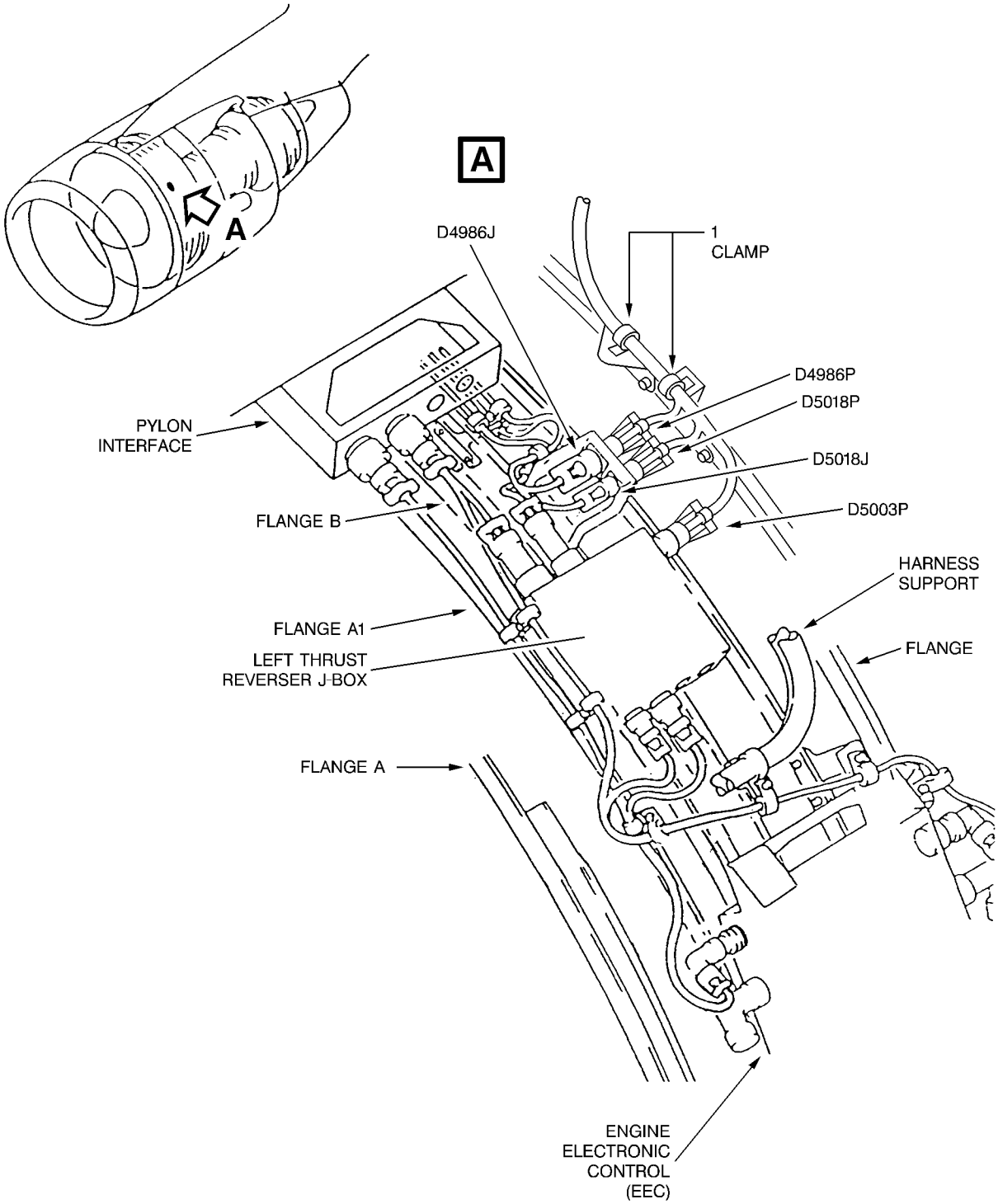
BM5 71 00 00 4 KFN0 01

Electrical Connectors - Connection with
Thrust Reverser Door (RH)
Figure 408



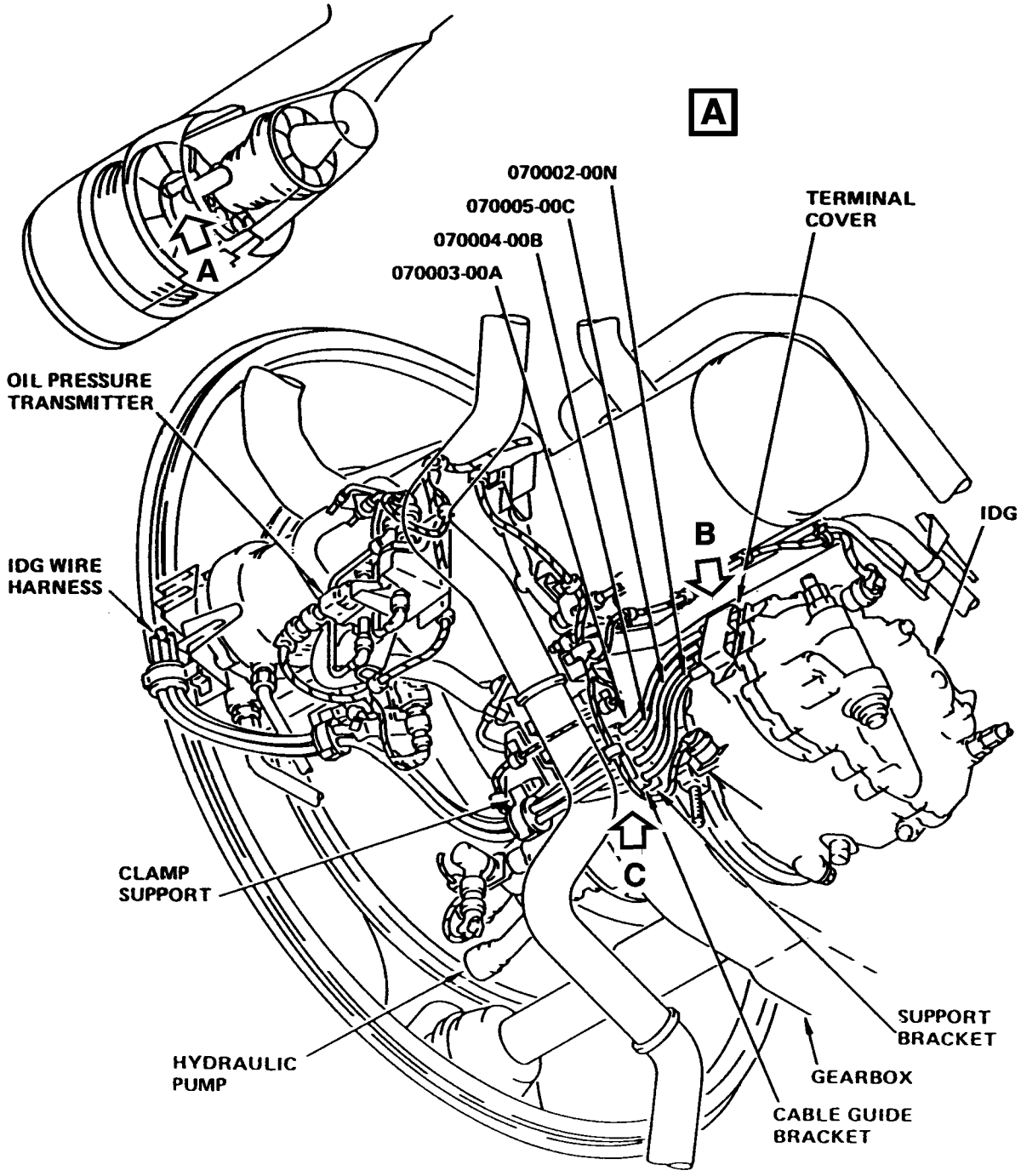
BM5 71 00 00 4 KSM0 00

Harness - Connection with Thrust Reverser Door (RH)
Figure 409

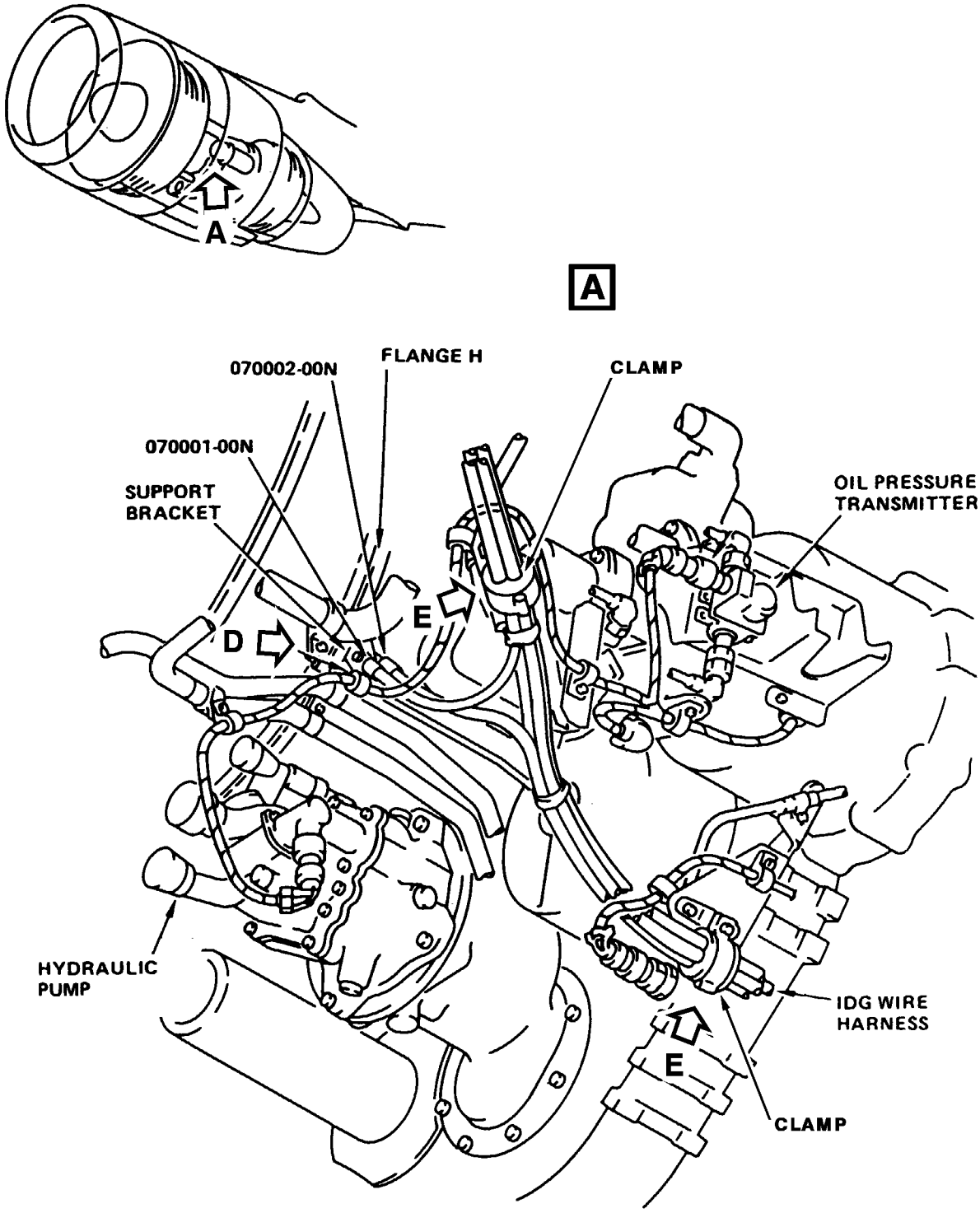


BM5 71 00 00 4 KHM0 02

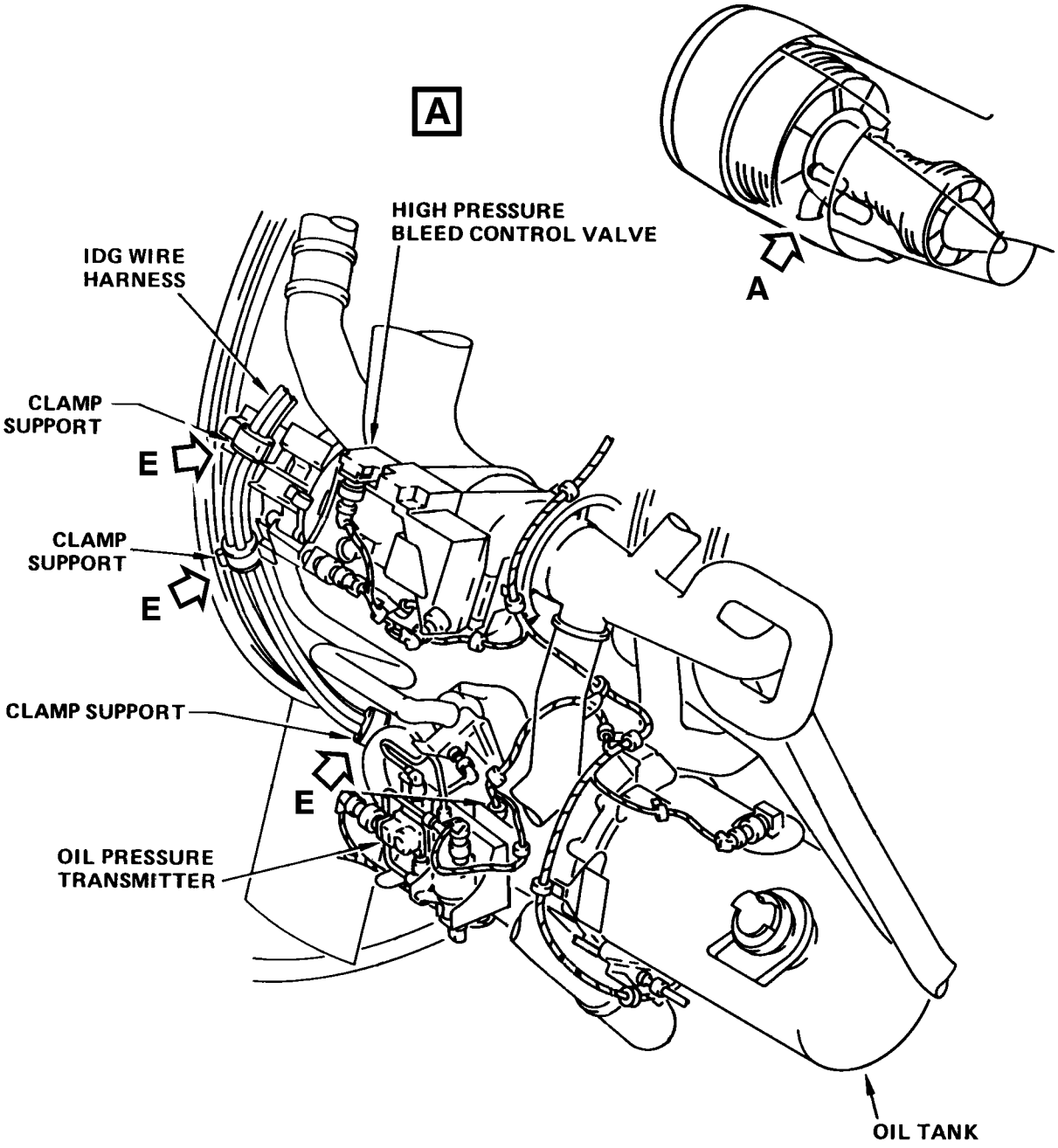
Electrical Connectors - Connections with
Thrust Reverser Door (LH)
Figure 410



IDG Wire Harness (Sheet 1/4)
Figure 411

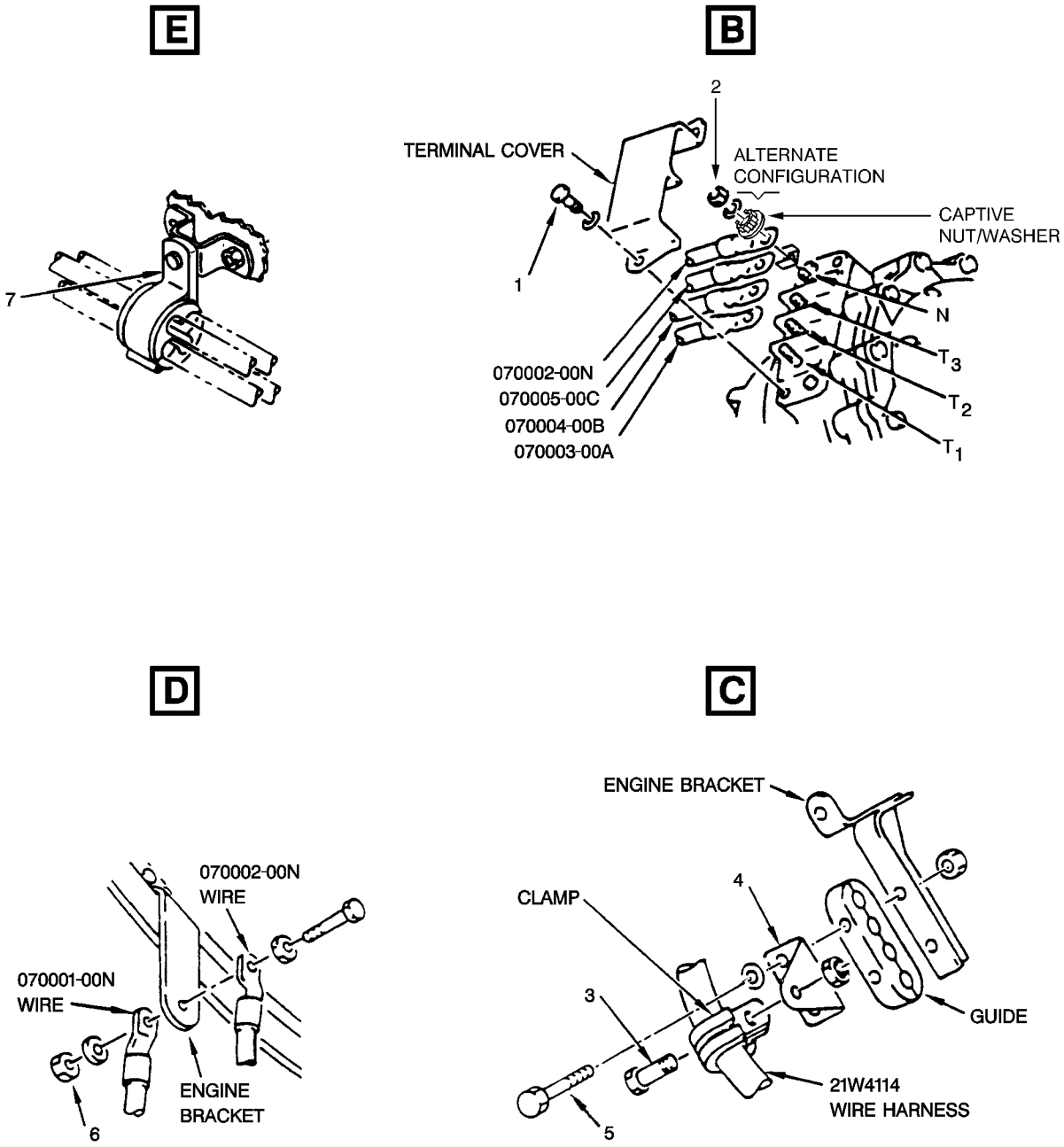


IDG Wire Harness (Sheet 2/4)
Figure 411



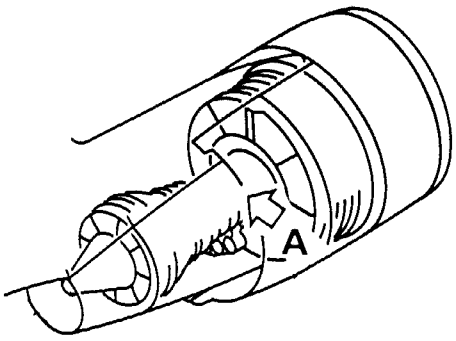
BM5 71 00 00 4 KMNS 01

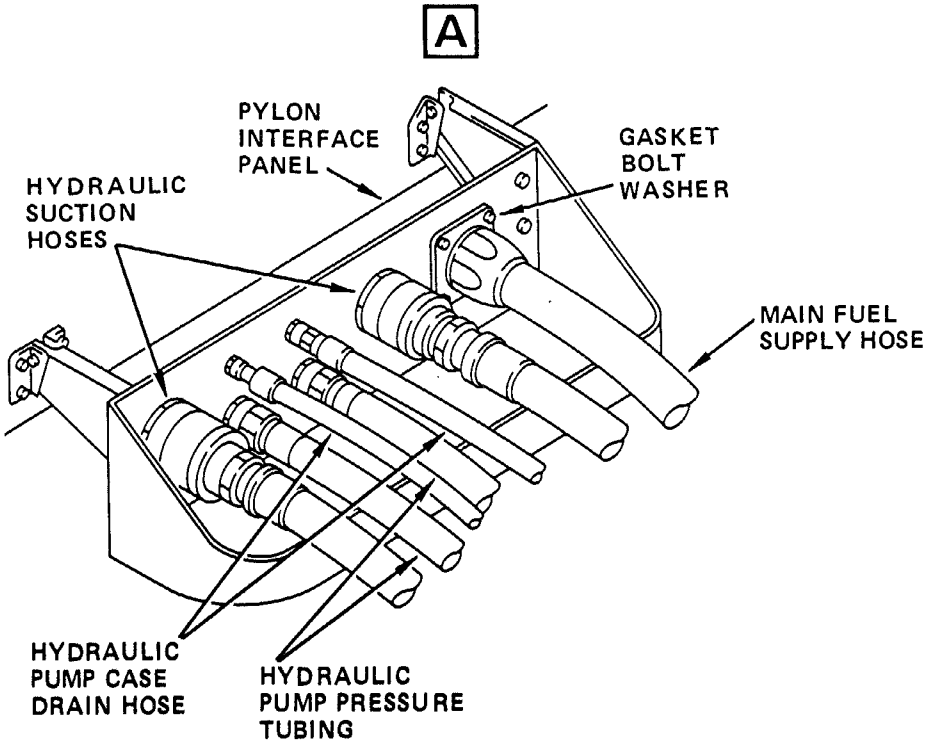
IDG Wire Harness (Sheet 3/4)
Figure 411



BM5 71 00 00 4 KMNV 01

IDG Wire Harness (Sheet 4/4)
Figure 411

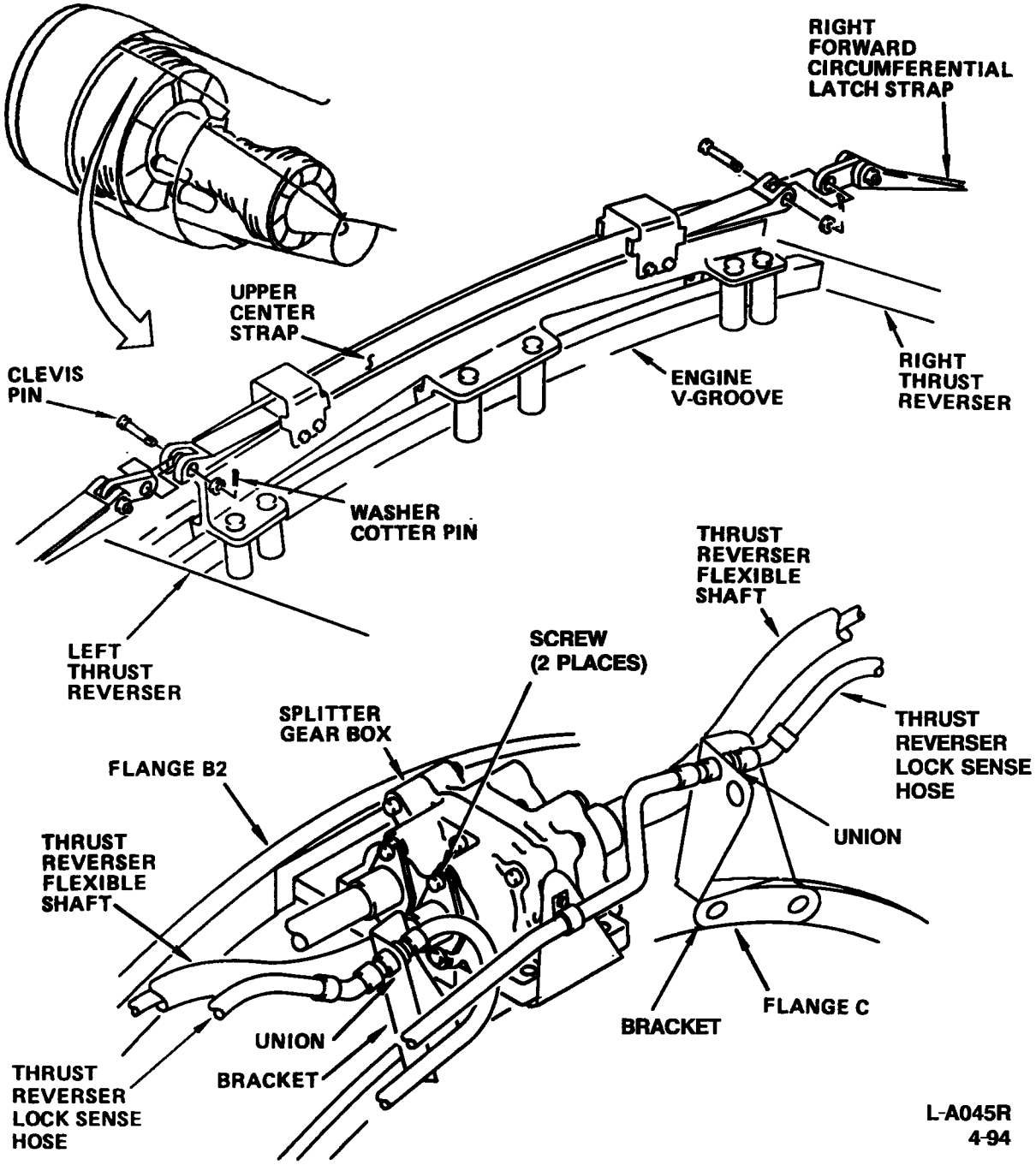




L-A044R

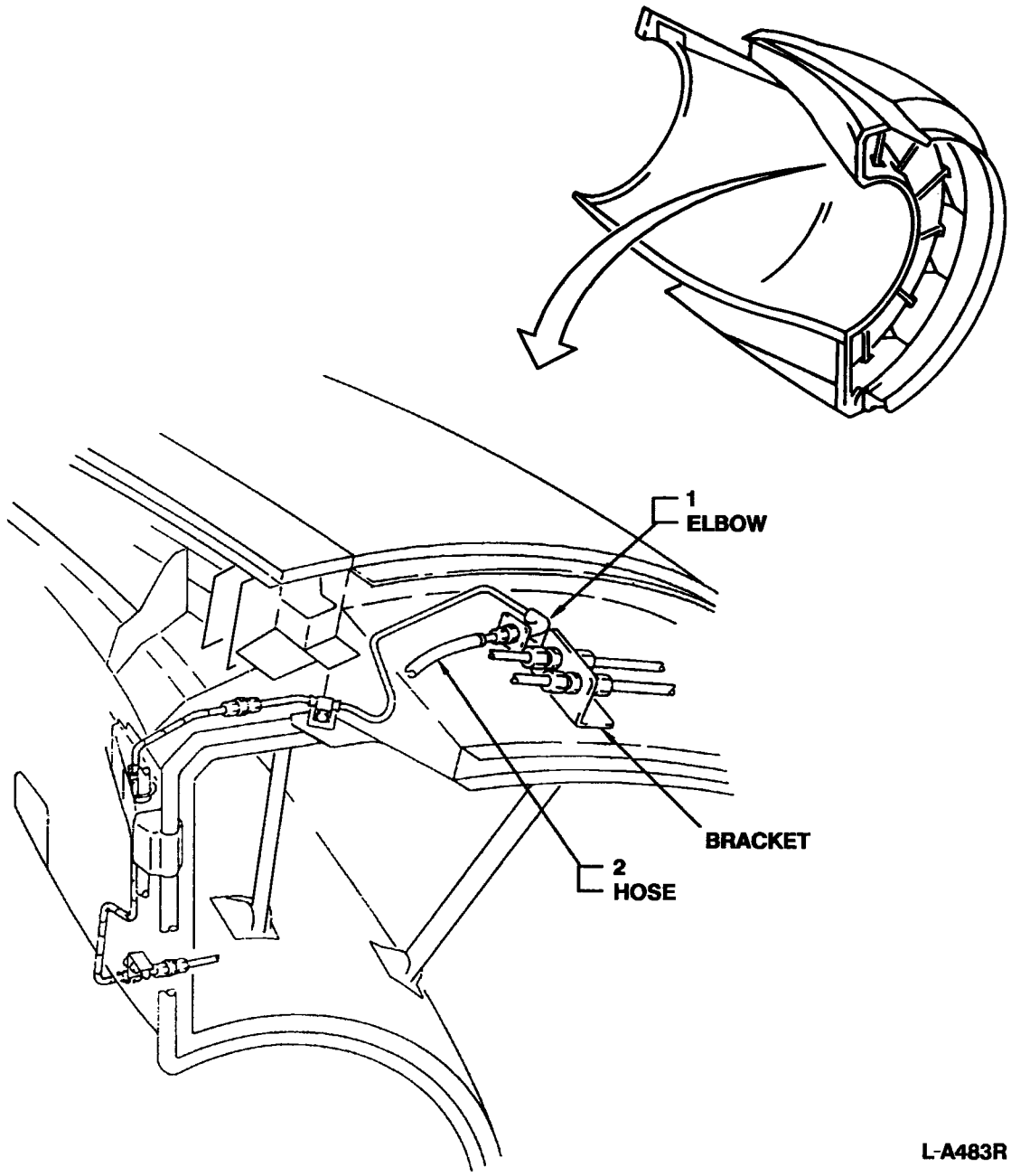
BM5 71 00 00 4 KGMO - 21

Fuel and Hydraulic Hoses
Figure 412



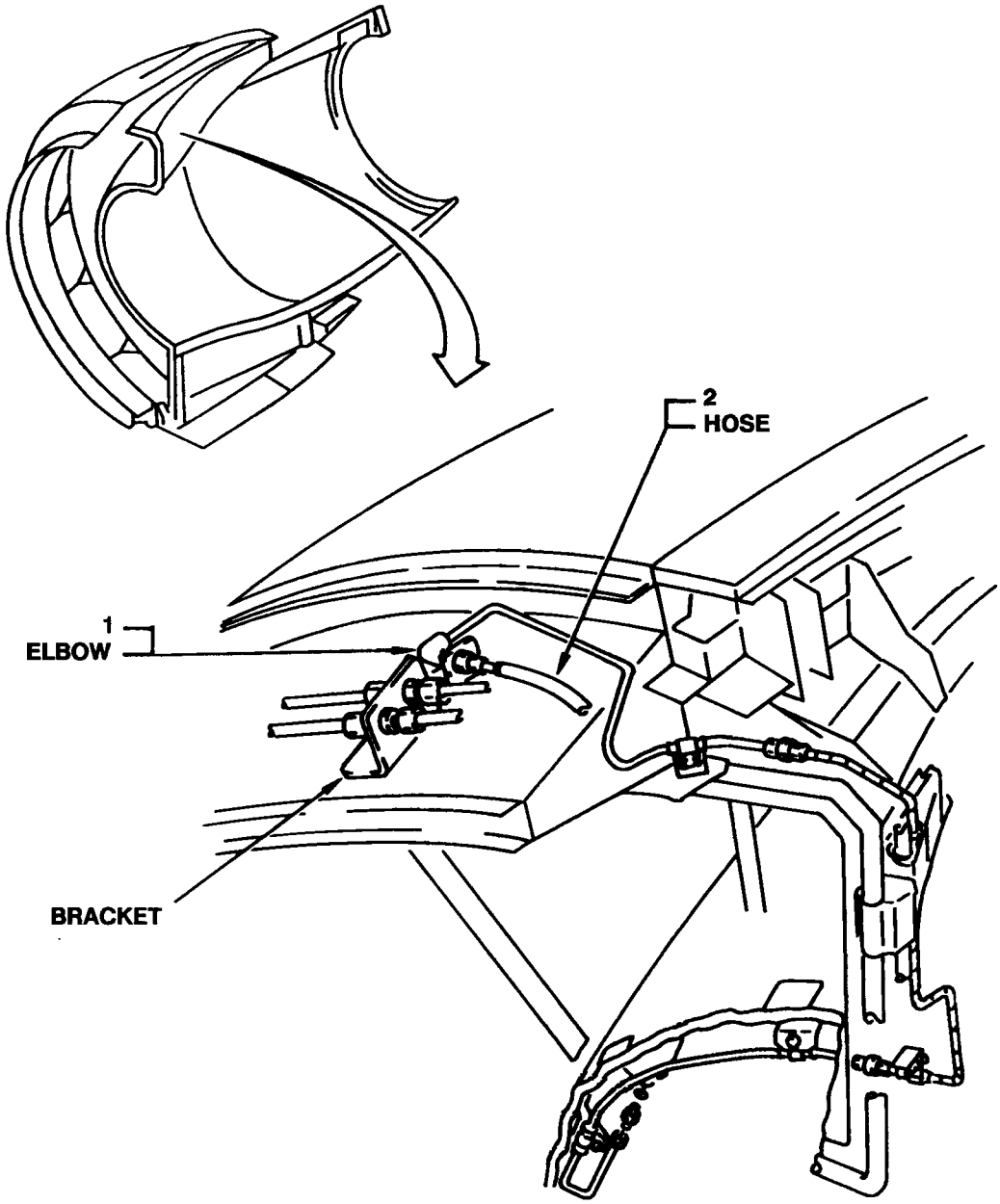
BM5 71 00 00 4 KJMO 02

Flexible Shafts, Thrust Reverser Sense Hoses and Forward Circumferential Latch Strap
Figure 413



BM5 71 00 00 4 KKMA 01

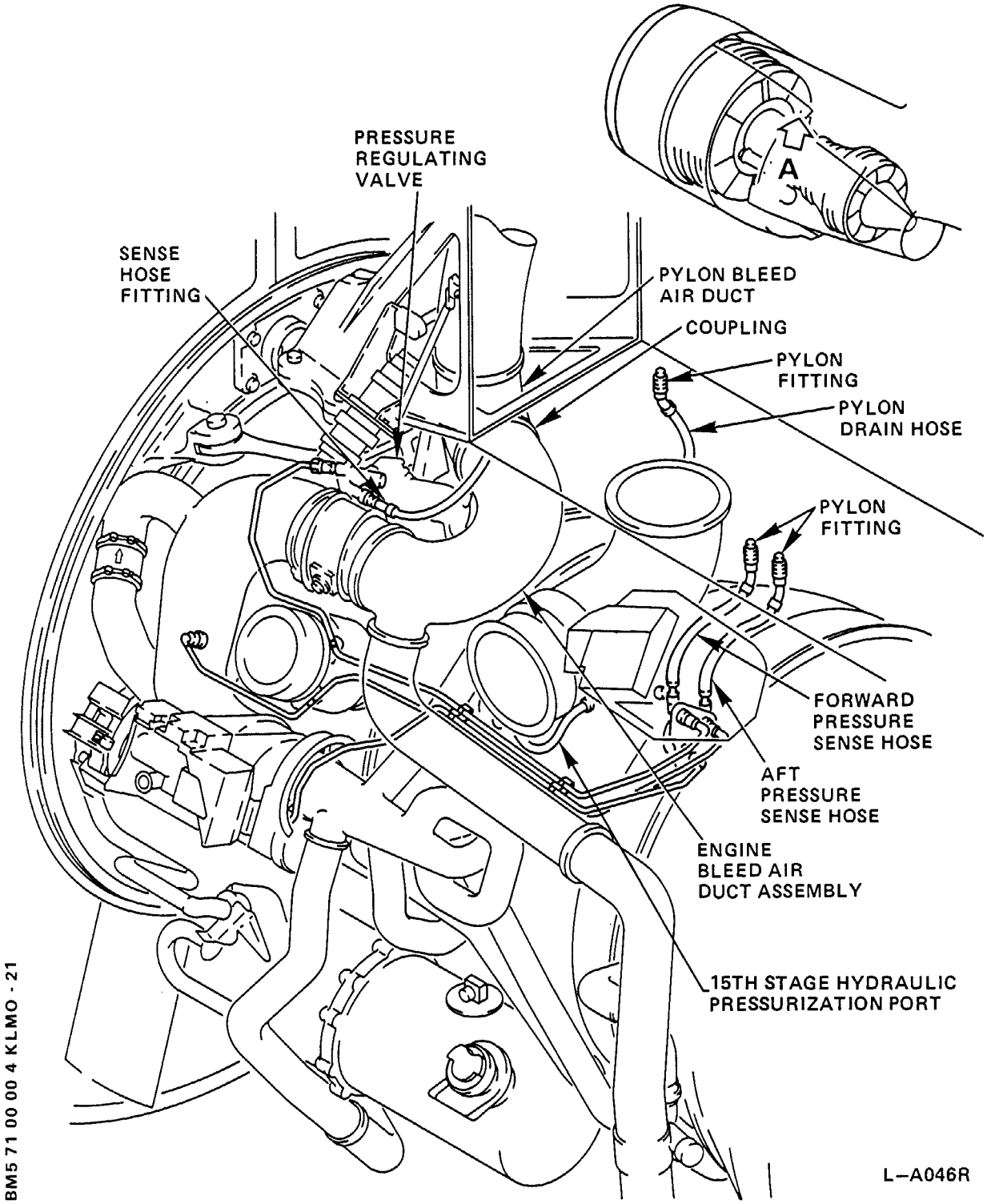
Nacelle Cooling Valve Pneumatic Tubes (L Side) (Sheet 1/2)
Figure 414



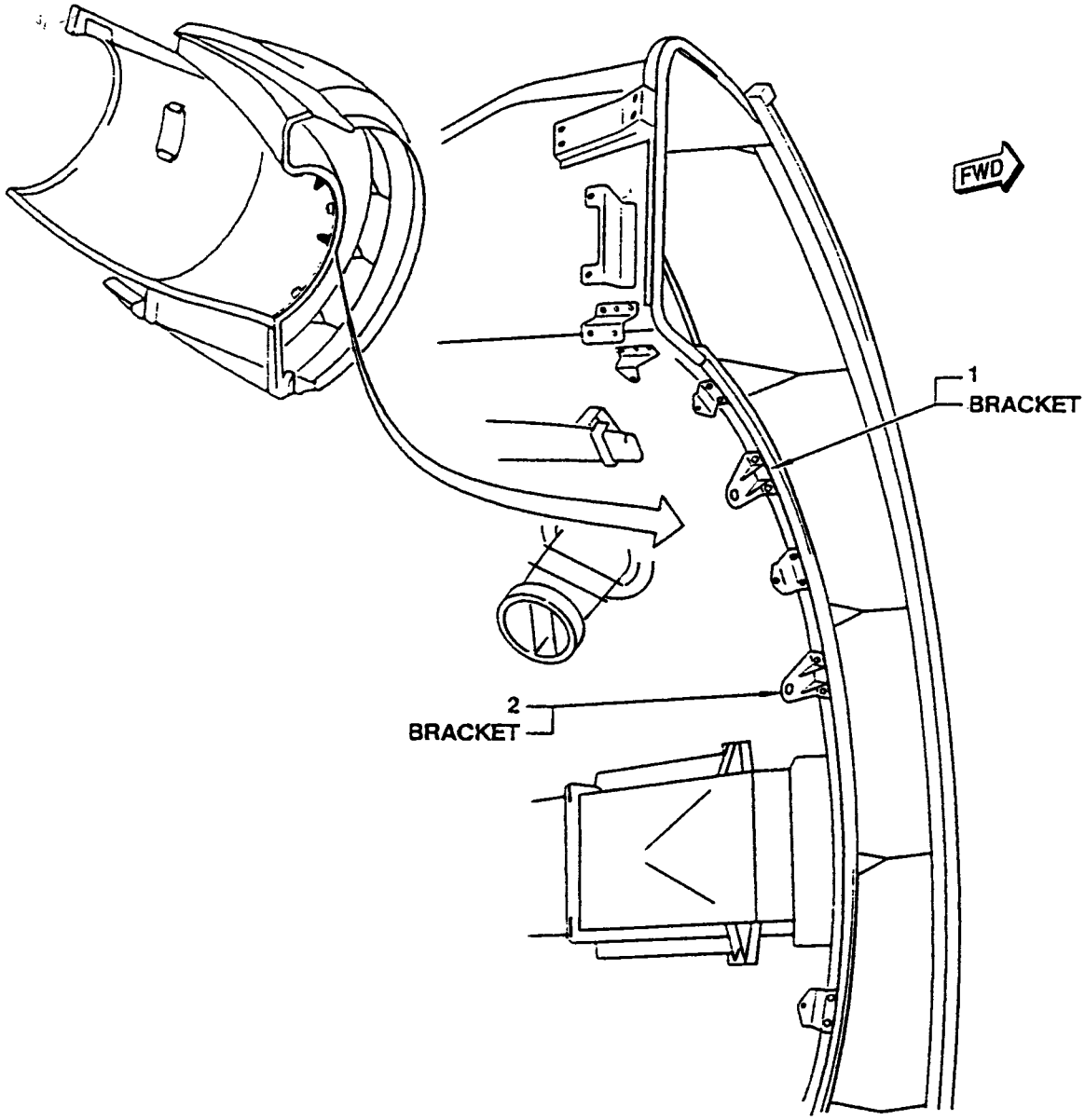
BM5 71 00 00 4 KKMJ 01

L-A484F

Nacelle Cooling Valve Pneumatic Tubes (R Side) (Sheet 2/2)
Figure 414



Bleed Air Ducting, Pressure Sense Hoses and Pylon Drain Tube
Figure 415



BM5 71 00 00 4 KJN0 00

IDG Wire Harness Attachment
Figure 416

(d)Install bootstrap arms (10) on either side of beam (6) and secure with pins (11).

(2)Install rear bootstrap as follows : (Ref. Fig. 418)

(a)Install rear bootstrap main beam (1) on pylon attachment lugs (3) with pins (2).

(b)Install arms (4) and (5) with pins (6).

(c)Install cable (7) and make certain that it is correctly positioned in the grooves of pulleys (8) and (9).

WARNING : MAKE CERTAIN THAT CABLE LENGTH IS EQUAL ON EITHER SIDE OF THE BOOTSTRAP.

(3)With fan cowl door normally open, install I tube of tool 98A71101502000, (Ref. Fig. 419). Attach item detail D to appropriate fitting of reverser cowls with reverser cowls in maximum open position, unlatch and stow fan cowl hold open rod while supporting fan cowl and engage hook of item detail D into I tube gusset. Install safety pin.

(4)Install the four hoists and allow approximately 1.70 m of chain to hang.

(5)Position engine storage and transportation trolley under engine so that chains are directly above hoist rings.
Check dynamometers for correct operation and set warning value to 2350 daN (5280 lbf) for each forward dynamometer and to 1100 daN (2470 lbf) for the aft dynamometer.

(6)Install the three dynamometers (2 forward and 1 aft) at the end of the chains and hook the cradle by the yokes.

(7)Secure fittings of cradle S277CR4000 onto engine (Ref. Fig. 420), details A and B.

(8)Raise cradle using the hoists and always keeping the frame horizontal.

(9)Connect cradle to the attachment fittings previously installed.

(10)Take-up slack in chains to approach dynamometer warning limit so that engine is immobilized during untightening of mounts.

(11)Remove bolts, nuts, washers and retainer assemblies securing engine forward mount bolts. Remove mount bolts, nuts and washers attaching forward mount to pylon beam (Ref. Fig. 421)

(12)Remove lockwire, mount bolts, and washers attaching aft mount to pylon beam.

WARNING : MAKE SURE THAT DURING ENGINE LOWERING PROCEDURE THE STIRRUPS OF REAR BEAM CABLE DO NOT JAM IN THE PULLEYS.
FOR THIS PURPOSE MAKE CERTAIN THAT CABLE LENGTH IS EQUAL ON EITHER SIDE OF THE BOOSTRAP.

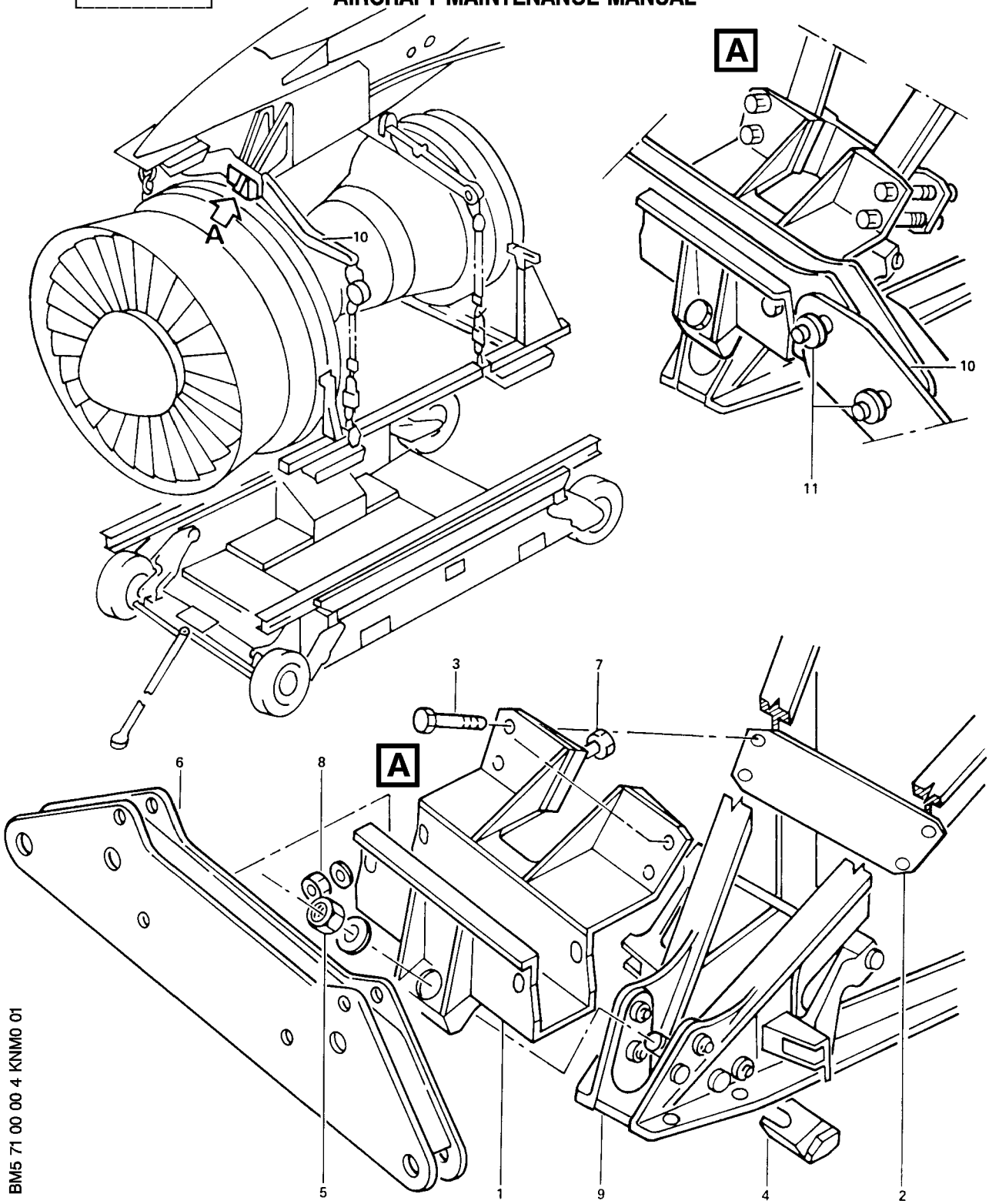
(13)Lower cradle using hoists and keeping the frame horizontal : a variation of 300 daN (675.6 lbf) maximum is allowed forward between the two dynamometers. Install on trolley, pin and remove chains.

(14)Remove engine/trolley assembly forward.

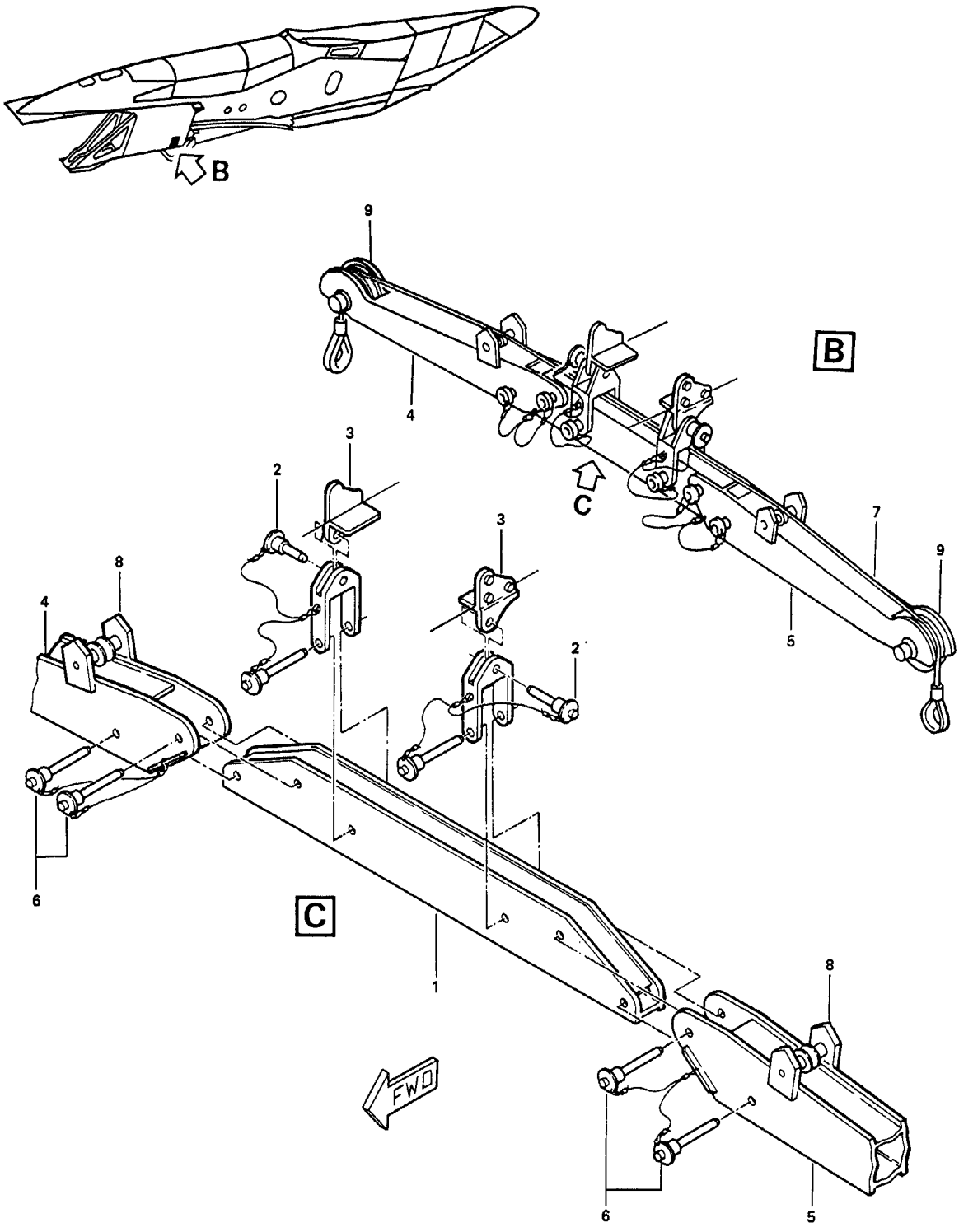
C. Removal by Means of Hydraulic positioner (Ref. Fig. 420, 421, 422).

WARNING : DURING LIFTING AND LOWERING BRAKES SHALL NOT BE APPLIED TO HYDRAULIC POSITIONER WHEELS.
WHEN TRAILING EMPTY POSITIONER ALWAYS KEEP IT AS LOW AS POSSIBLE AND DRIVE AT VERY SLOW SPEED, ESPECIALLY ON BAD ROADS.

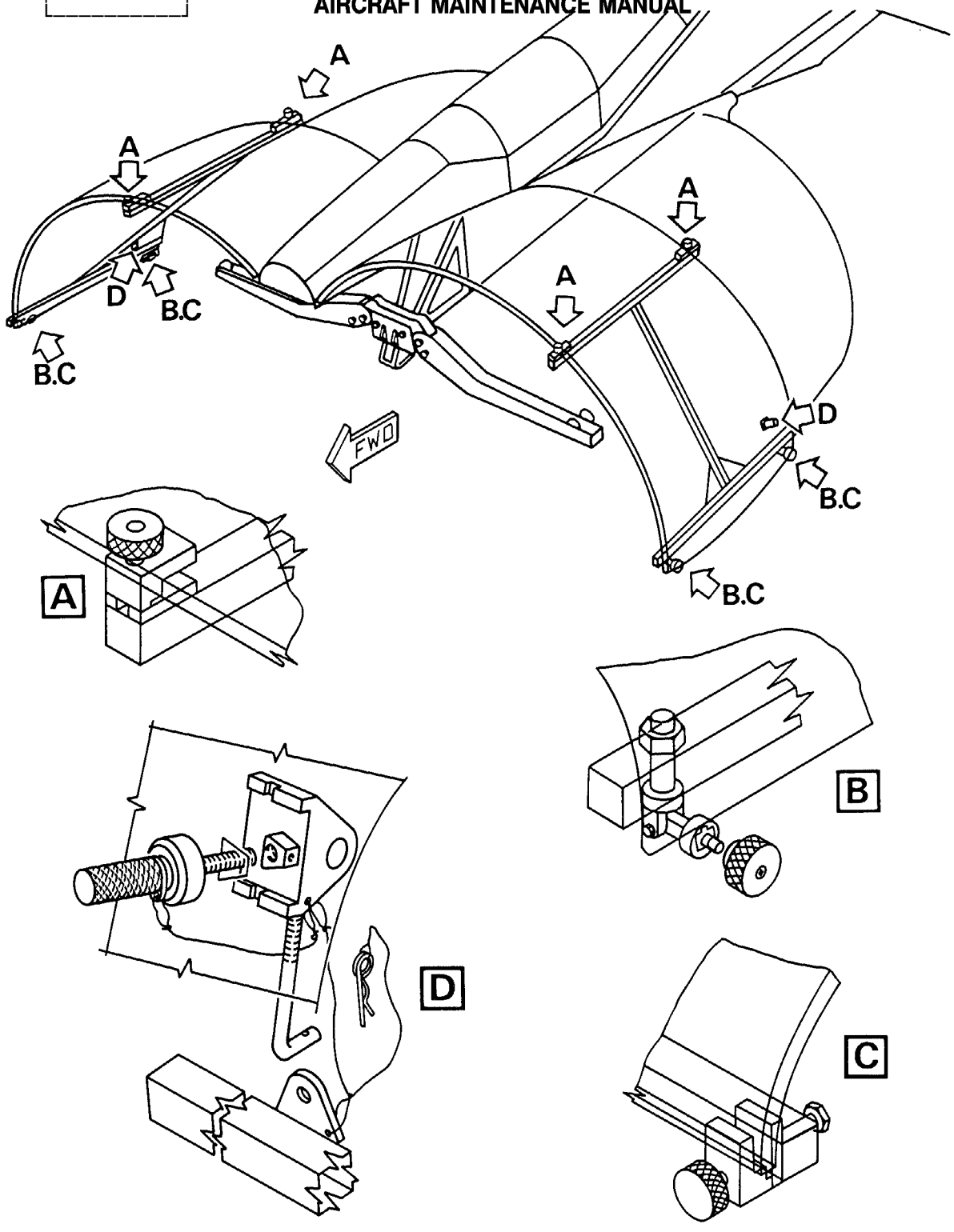
NEVER FORGET TO REMOVE RATCHETS FROM RATCHET WHEEL.



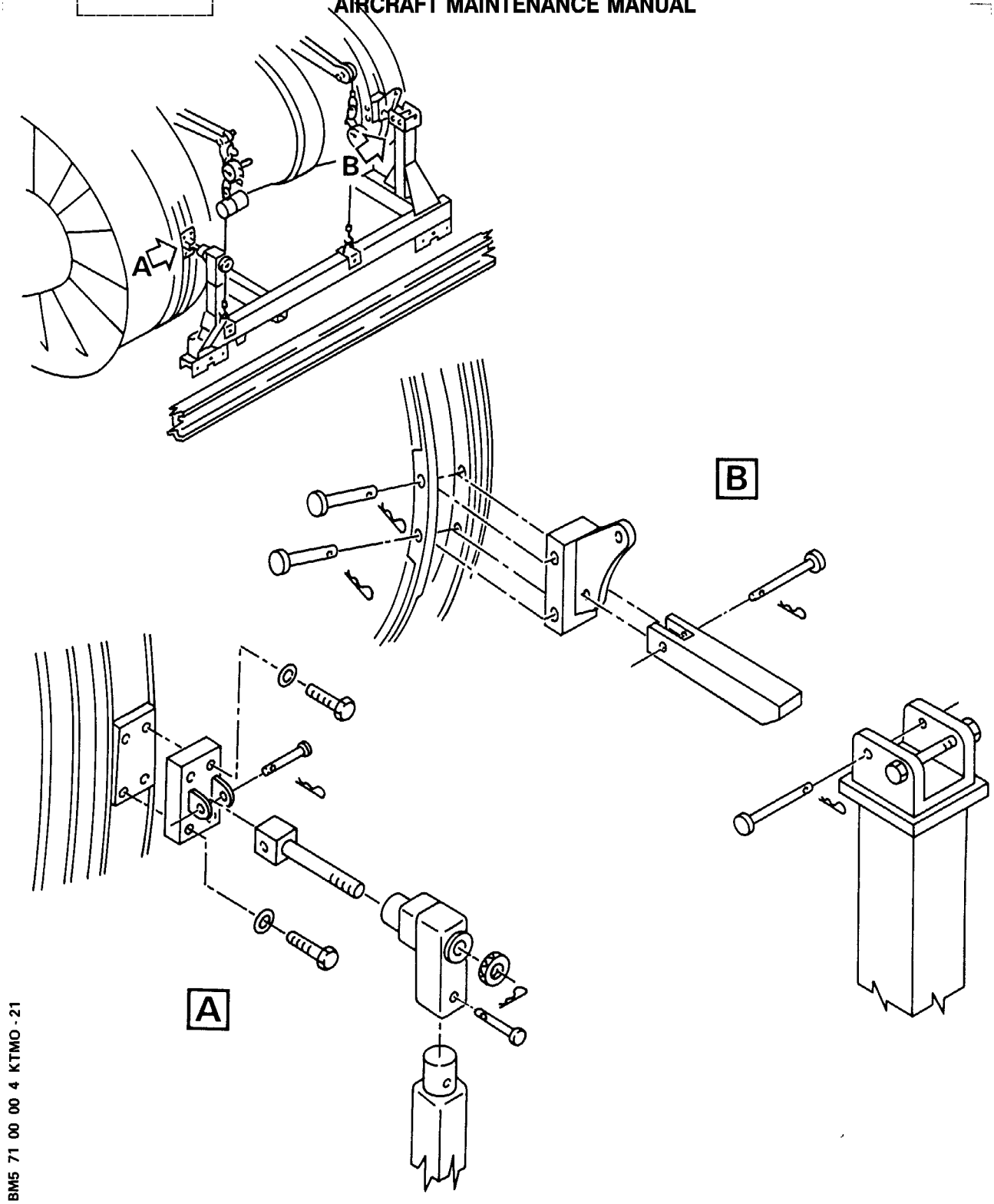
Installation of Engine Bootstrap at Forward Mount
Figure 417



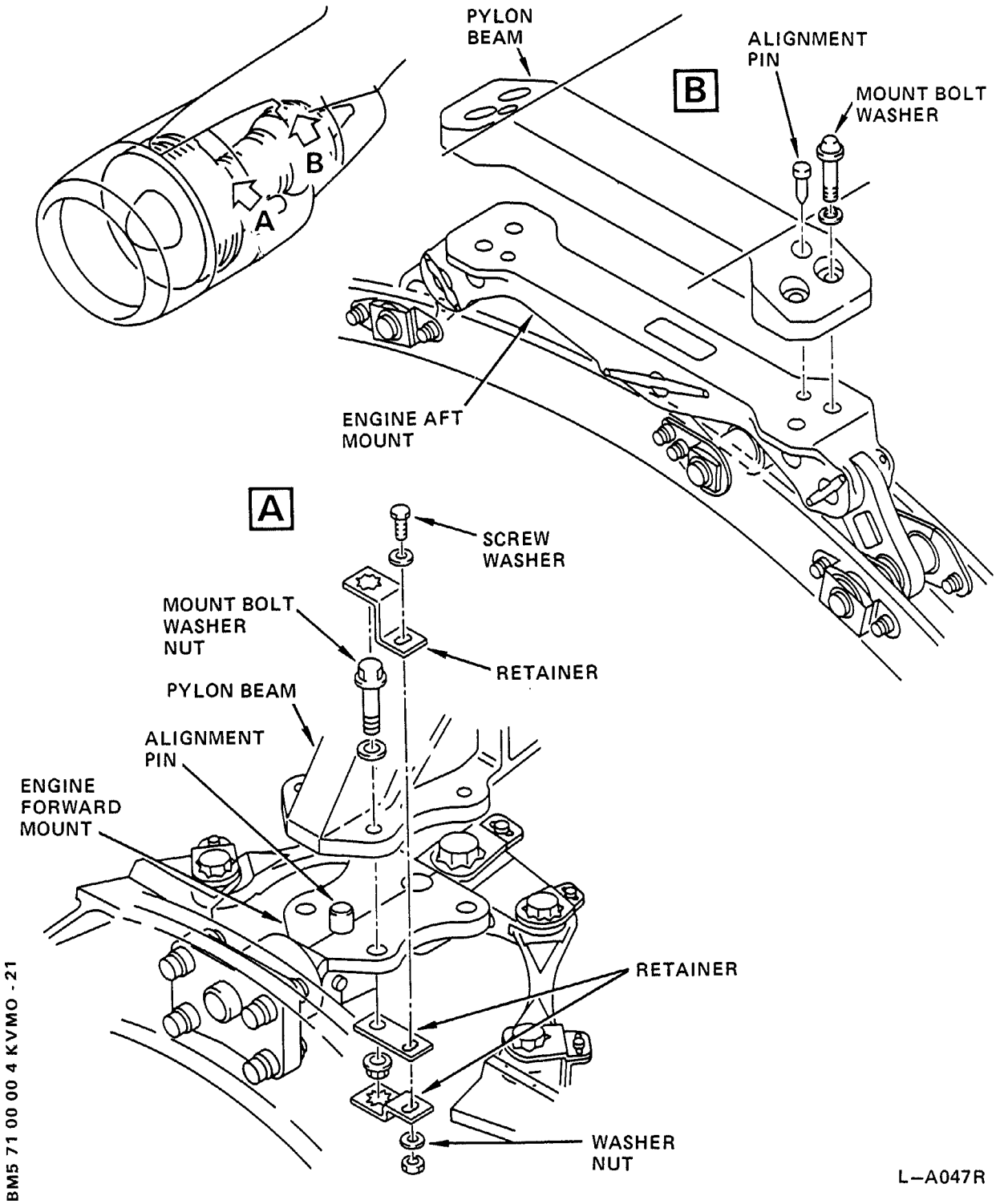
Installation of Engine Bootstrap at Aft Mount
Figure 418



Fan Cowl Door Hold Open Fixture (With Bootstrap)
Figure 419



Cradle Adapter Assembly
Figure 420



Forward and Aft Engine Mounts
Figure 421

GENEROUSLY APPLY GRAPHITE GREASE TO SUPPORTING PADS OF RAILS.

ALWAYS OBSERVE THAT FRONT AND REAR FITTINGS DISENGAGE FROM ADAPTER WHEN LOWERING POSITIONER OTHERWISE THERE IS A GREAT RISK OF RETAINING RAILS AND BENDING ADJUSTMENT SCREWS.

ALWAYS REMOVE FOUR LOCATING SCREWS BEFORE ADJUSTING RAILS CENTER LINE WITH TWO SIDE ADJUSTING SCREWS. ALWAYS INSTALL THESE FOUR SCREWS BEFORE TRAILING POSITIONER.

WHEN LOWERING POSITIONER ALWAYS MAKE CERTAIN THAT THE FOUR RATCHETS ARE COMPLETELY FREE, IF NOT STOP MOVEMENT IMMEDIATELY. PUMP UP AGAIN, LIBERATE RATCHETS, AND LOWER AGAIN.

(1)Procedure with positioner to engine preloading (recommended procedure).

NOTE : Hydraulic positioner must be equipped with load measurement device which can give the load repartition (forward and aft position), and warning to prevent the overloads.

(a)Install tool 98A71103511000 to maintain fan cowl doors open and stow hold open rods (Ref. Fig. 423)

(b)Bring cradle S277CR4000 near hydraulic positioner SMIG277HP or equivalent (Ref. Fig. 422).

(c)Remove attachment fittings from cradle S277CR4000 and install and secure fittings onto engine (Ref. Fig. 420) details A and B.

(d)At each roller of cradle loosen the two clamps and shake them to make certain that they are clear of the rail.

(e)Remove the eight ball lock pins from rollers and retain.

(f)Check indicators for correct operation. On both indicators read value F shown.
Set warning value as follows :
- Forward indicator : F + 300 daN (675 lbf.)
- Aft indicator : F + 200 daN (450 lbf.).

(g)With tow bar on the exhaust side, make a long approach and push cradle S277CR4000 and hydraulic positioner SMIG277HP assembly or equivalent under engine. One man shall guide the operation and check for alignment. Stop positioner when the four fittings align with their corresponding locations on adaptor.

(h)Remove the four locating screws from underneath the four supporting pads of positioner frame.

(i)Raise front and rear axle of positioner simultaneously. One man at each pump, one man at each fitting watching for fitting engagement in adaptor.
Stop lifting when fittings are nearly engaged.

(j)Push cradle forward or aft to obtain the best possible alignment. Correct misalignment with the two adjustment screws.
CAUTION : USE POSITIONER WITH EXTREME CARE WHEN RAISING TO FINAL POSITION OR DAMAGE TO MOUNTS AND PYLON COULD RESULT.

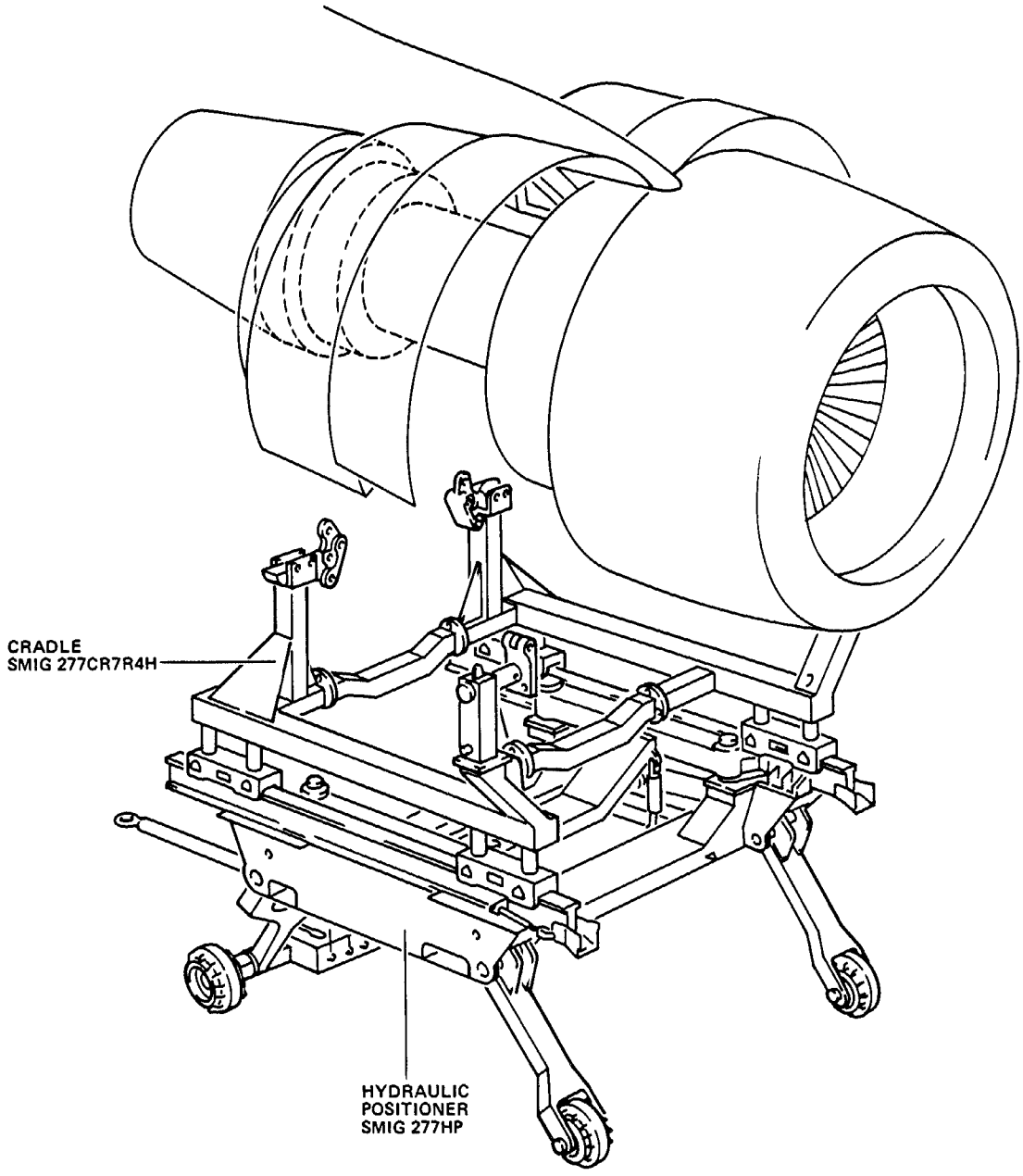
(k)When alignment of positioner center line and engine center line is considered to be satisfactory continue raising as evenly as possible until the two rear fittings engage in their U shaped supports. (If necessary tap with hide mallet). Observe that the two front fittings engage post heads on cradle.

(l)Monitor the load indicators and raise the positioner with extreme care until the warning values are reached.
(m)Remove screws, washers, nuts and retainers securing bolts of engine forward mount (Ref. Fig. 421).
(n)Cut and remove lockwire safetying bolts of engine aft mount.
(o)Unscrew simultaneously the 8 bolts of the engine forward and aft mounts (4 per mount) until the positioner bears the whole engine weight.
(p)Install and safety cotter pins into fittings of cradle (Ref. Fig. 420).
CAUTION : ENGINE MOUNT BOLTS SHALL ONLY BE REMOVED WHEN THERE IS A GAP OF APPROX. 15 MM (0.6 IN.) UNDER CENTERING SPIGOTS.
(q)Remove bolts from engine forward and aft mounts (Ref. Fig. 421).
(r)Unlock front and rear hydraulic jack ratchets.
WARNING : BEFORE LOWERING PUMP ONE OR TWO STROKES UP BEFORE UNLOCKING AND RELEASE OIL RETURN.
(s)Open the two return valves of the two front and two rear jacks gradually and simultaneously. Keep engine center line horizontal during operation.
One observer on each side shall watch that engine is coming down without any interference.
(t)Realign two rails with adjusting screws and install the four locating screws.
(u)Align rollers with corresponding points on rails, install the eight ball lock pins and tighten the eight securing clamps.
(v)With engine clear of engine pylon, positioner may be cleared forward with one man at each wheel and one man at tow bar.
NOTE : Whenever engine must be displaced it is mandatory to install engine and cradle assembly on engine transportation trolley SMIG277ETT or SMIG277ETT2.

(2)Procedure with gap between positioner and engine (alternate procedure)
(a)Install tool 98A71103511000 to maintain fan cowl doors open and stow hold open rods (Ref. Fig. 423)
(b)Bring cradle S277CR4000 near hydraulic positioner SMIG277HP or equivalent (Ref. Fig. 422).
(c)Remove attachment fittings from cradle S277CR4000 and install and secure fittings onto engine (Ref. Fig. 420) details A and B.
(d)At each roller of cradle loosen the two clamps and shake them to make certain that they are clear of the rail.
Remove the eight ball lock pins from rollers and retain.
(e)Raise positioner about 1.5 m (4.92 ft.) above ground.
(f)With tow bar on the exhaust side, make a long approach and push cradle S277CR4000 and hydraulic positioner SMIG277HP assembly or equivalent under engine. One man shall guide the operation and check for alignment. Stop positioner when the four fittings align with their corresponding locations on adaptor.
(g)Remove the four locating screws from underneath the four supporting pads of positioner frame.
(h)Raise front and rear axle of positioner simultaneously. One man at each pump, one man at each fitting watching for fitting engagement in adaptor.
Stop lifting when fittings are nearly engaged.

(i)Push cradle forward or aft to obtain the best possible alignment. Correct misalignment with the two adjustment screws.
CAUTION : USE POSITIONER WITH EXTREME CARE WHEN RAISING TO FINAL POSITION OR DAMAGE TO MOUNTS AND PYLON COULD RESULT. NEVER OPERATE POSITIONER TO COMPLETELY CLOSE GAP BETWEEN FITTINGS AND ADAPTORS.
(j)When alignment of positioner center line and engine center line is considered to be satisfactory continue raising as evenly as possible until the two rear fittings engage in their U shaped supports. (If necessary tap with hide mallet). Observe that the two front fittings engage post heads on cradle.
(k)Stop raising positioner after four fittings are fully engaged in cradle and a gap of approx. 6 mm (1/4 in.) exists between fittings and cradle.
(l)Remove screws, washers, nuts and retainers securing bolts of engine forward mount (Ref. Fig. 421).
(m)Cut and remove lockwire safetying bolts of engine aft mount.
(n)Unscrew simultaneously the 8 bolts of the engine forward and aft mounts (4 per mount) until the positioner bears the whole engine weight.
(o)Install and safety cotter pins into fittings of cradle (Ref. Fig. 420).
CAUTION : ENGINE MOUNT BOLTS SHALL ONLY BE REMOVED WHEN THERE IS A GAP OF APPROX. 15 MM (0.6 IN.) UNDER CENTERING SPIGOTS.
(p)Remove bolts from engine forward and aft mounts (Ref. Fig. 421).
(q)Unlock front and rear hydraulic jack ratchets.
WARNING : BEFORE LOWERING PUMP ONE OR TWO STROKES UP BEFORE UNLOCKING AND RELEASE OIL RETURN.
(r)Open the two return valves of the two front and two rear jacks gradually and simultaneously. Keep engine center line horizontal during operation.
One observer on each side shall watch that engine is coming down without any interference.
(s)Realign two rails with adjusting screws and install the four locating screws.
(t)Align rollers with corresponding points on rails, install the eight ball lock pins and tighten the eight securing clamps.
(u)With engine clear of engine pylon, positioner may be cleared forward with one man at each wheel and one man at tow bar.
NOTE : Whenever engine must be displaced it is mandatory to install engine and cradle assembly on engine transportation trolley SMIG277ETT or SMIG277ETT2.

D. Engine Installation Preparation Procedures
CAUTION : MAKE SURE THE THRUST REVERSER AND NOZZLE ARE THE CORRECT CONFIGURATION FOR THE ENGINE YOU PLAN TO INSTALL. AS A RESULT OF THE INCORPORATION OF SB PW4ENG 72-756 OR PW4ENG 72-759, MODIFICATION OF THE HPC TO INCORPORATE A RING CASE CONFIGURATION (RCC), IT IS NOT ACCEPTABLE, DUE TO WEIGHT RESTRICTIONS, TO INSTALL A POST SB 72-756 OR SB 72-759 ENGINE ON-WING IN COMBINATION WITH A THRUST REVERSER IMPROVEMENT PROGRAM (TRIP) CONFIGURATION THRUST REVERSERS (S/N 0714001 AND ON) AND INCONEL EXHAUST NOZZLES (S/N 1 THROUGH 0744001) IF ANY OF THE FOLLOWING



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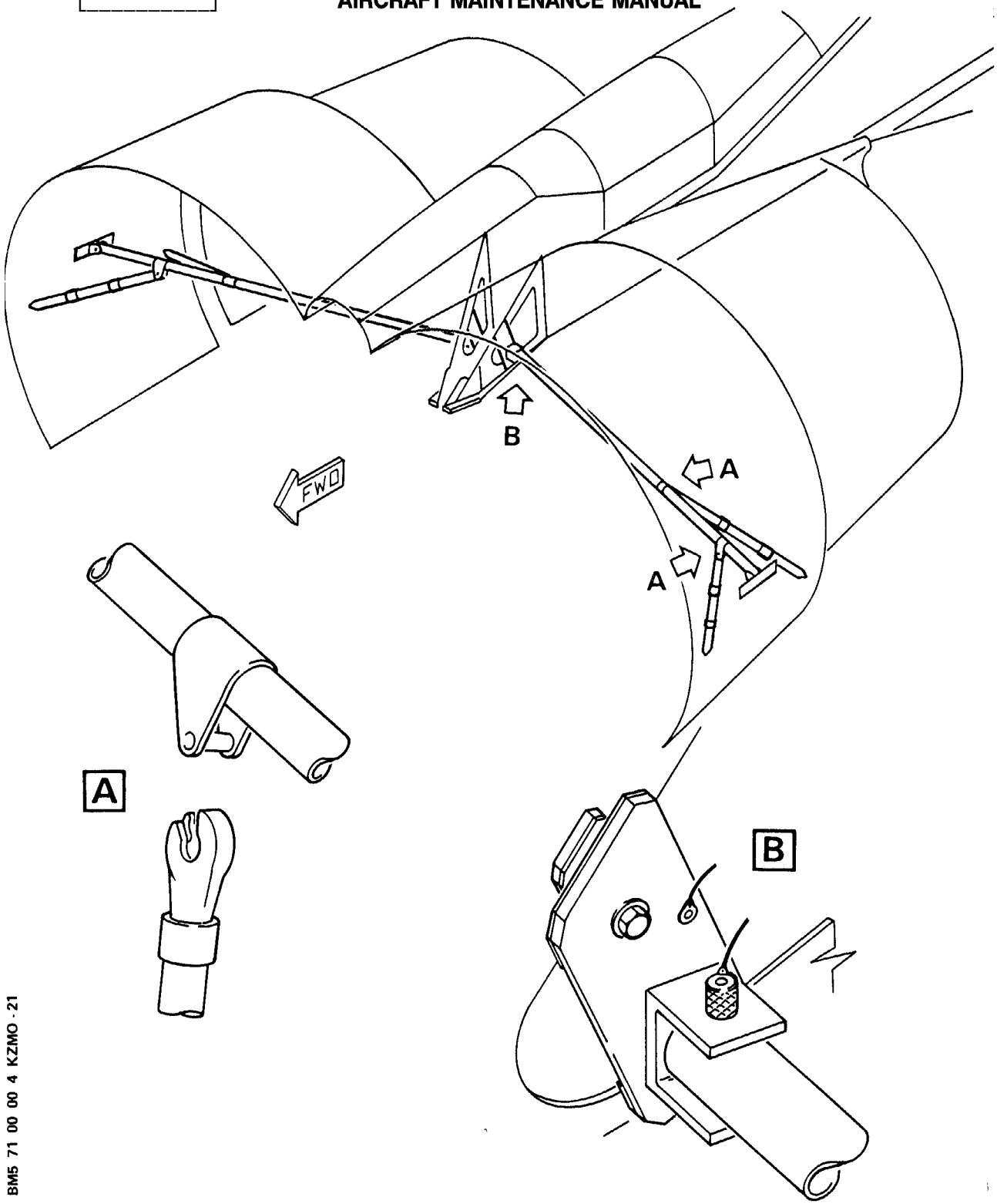
Installation of Hydraulic Positioner
Figure 422



Fan Cowl Door Hold Open Fixture (Without Bootstrap)
Figure 423

OPTIONS ARE INCLUDED ON THE NACELLE : SCU, ACOUSTICALLY TREATED INLET OR ACOUSTIC PLUG.
REFER TO INSPECTION SB PW4NAC 78-111 THAT DEFINES THE DISALLOWED COMBINATIONS WHICH WILL RESULT IN AN UNACCEPTABLE PROPULSION SYSTEM WEIGHT.

CAUTION : SIGNIFICANT FLIGHT OPERATIONAL INTERMIX CONCERNS EXIST BETWEEN ENGINES AND THRUST REVERSERS (REF. 71-00-10, P. BLOCK 201).

(1)Prior to replace the engine (Ref. 71-00-10, P. Block 201).

NOTE : At each engine Removal/Installation, a visual inspection of the mount assemblies and a non-destructive testing and running torque check of engine mount bolts have to be performed before engine installation as detailed in the following steps or following referenced procedures.

(2)Prior to engine installation, in case of previous repair with installation of bushes in spigot holes or in tensile bolt holes (Ref. SRM 54-51-81, P. Block 201), check the bushes for damage and check that they have not migrated. In case of bush damage or migration, please contact Airbus.

(3)Inspect forward mount assembly (Ref. 71-21-00, P. Block 601) and aft mount assembly (Ref. 71-22-00, P. Block 601).
Close attention should be paid to the threaded area of the bolts to ensure that no damage exists which would preclude proper thread engagement with the mating part.

CAUTION : ENSURE THAT AFT FAIRING SEAL AND TENSION SPRINGS ARE CORRECTLY POSITIONED. FAILURE TO COMPLY WILL RESULT IN DAMAGE TO ENGINE NOZZLE (Ref. Fig. 424).

(4)Check that all engine mounts are properly installed (Ref. 71-21-00, P. Block 401 and 71-22-00, P. Block 401).

(5)With engine removed, visually check condition of pylon lower surface including forward and aft engine mount fitting/beam. (Ref. 54-51-00, P. Block 601). When corrosion is found on pylon lower surface around the engine aft attachment beam assembly, the beam assembly including the shim must be removed to check extent of corrosion and to allow corrosion removal. For beam removal (Ref. 54-51-85, P. Block 401). For shim removal (Ref. 54-51-86, P. Block 401).

(6)Lubricate engine mounts and bolts as follows :

(a)On forward mount :

1 Clean thoroughly bolts, nuts, alignment pin, corresponding holes, and contact surfaces between engine mount and pylon with cleaning agent (Material No. 11-026A) to eliminate deposits of grease and dust.

2 Apply grease, Material No. 04-014A to the forward alignment pin (thrust pin) and alignment pin hole.

3 Apply grease, Material No. 04-014A to the four, thread nuts and bolts, under side of boltheads, and washers on both sides.

(b)On aft mount :

1 Clean thoroughly bolts, nuts, alignment pin, corresponding holes, and contact surfaces between engine mount and pylon to eliminate deposits of grease and dust.

2 Apply grease, Material No. 04-014A to the aft mount alignment pins.

3 Apply grease, Material No. 04-014A to the four, thread bolts, under side of boltheads, and washers on both sides.

(7)With engine removed check engine mount bolts for locking capability.
(a)Check running torque of mount bolts and nuts for minimum torque of 70 lbf.in. (0.80 m.daN).
(8)Perform the following test :
(a)LP fuel fire shut off valve internal leakage (Ref. 28-24-00, P. Block 501).
(b)Cross check valve position indication in flight compartment with mechanical position indicator on valve body.

E. Installation by Means of Bootstrap Device (Ref. Fig. 417, 418, 419) (Ref. Fig. 420, 421)

WARNING : - MAKE SURE THAT DURING ENGINE RAISING PROCEDURE THE STIRRUPS OF REAR BEAM CABLE DO NOT JAM IN THE PULLEYS.
FOR THIS PURPOSE MAKE CERTAIN THAT CABLE LENGTH IS EQUAL ON EITHER SIDE OF THE BOOTSTRAP.
- VALUES ON DYNAMOMETERS MUST BE CLOSELY MONITORED.
- IN CASE OF JAMMING OF THE STIRRUPS OF REAR BEAM CABLE IN THE PULLEYS, OVERLOADS CAN BE APPLIED ON THE PYLON AFT HOIST FITTINGS WITH A POSSIBLE FAILURE AT TOOLING ATTACHMENTS WHICH COULD LEAD TO THE ENGINE FALL WITH AS A POSSIBLE CONSEQUENCE SERIOUS INJURY TO PERSONNEL.
- IF OVERLOADS ARE APPLIED AS A PREVENTIVE MEASURE PYLON AFT HOIST FITTINGS AND BOLTS MUST BE SYSTEMATICALLY REPLACED.

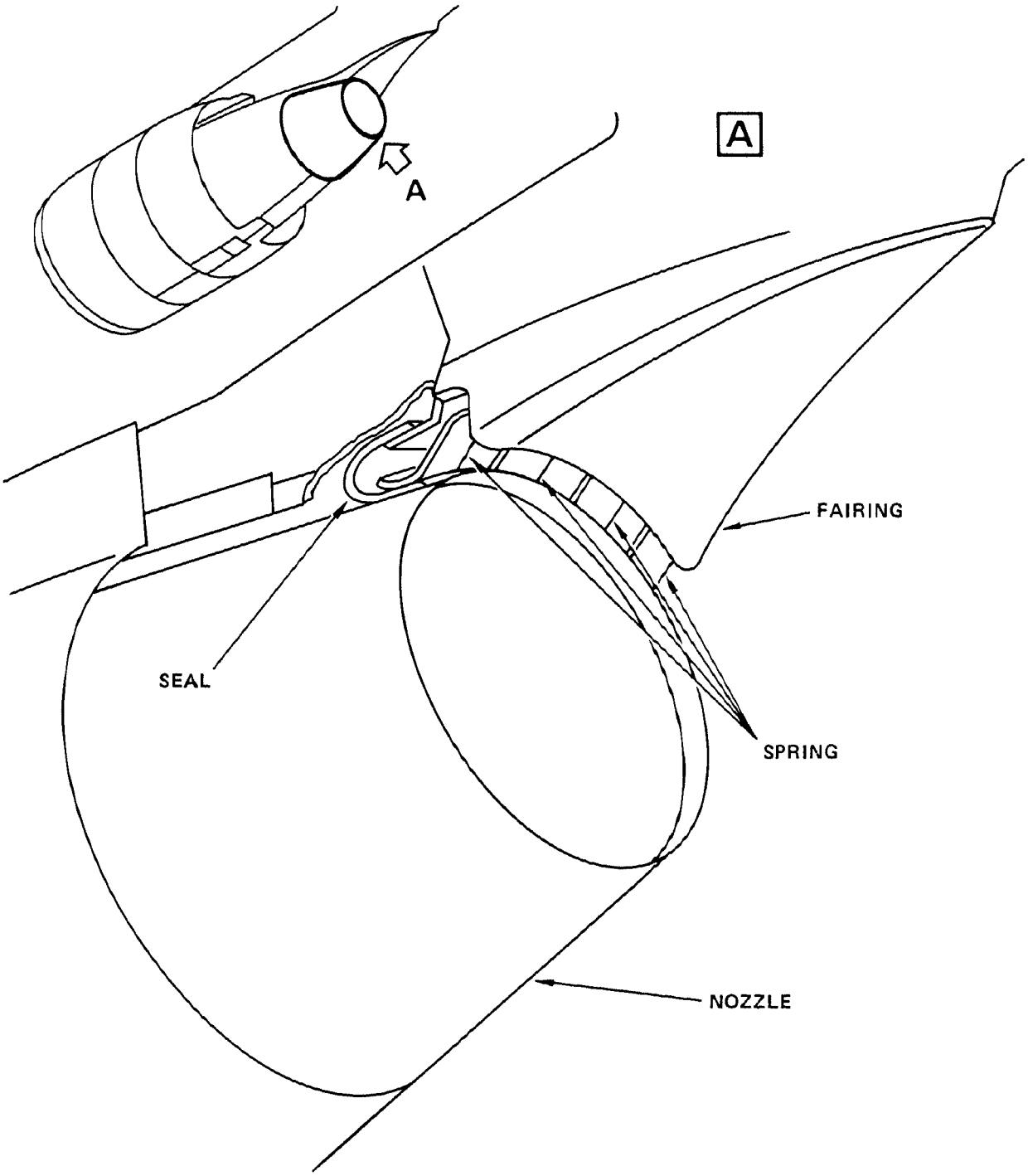
CAUTION : DO A CHECK OF THE ENGINE DATA PLATE TO MAKE SURE THAT THE ENGINE IS CORRECT FOR THE AIRCRAFT.
IF YOU INSTALL AN ENGINE THAT DOES NOT HAVE THE CORRECT CONFIGURATION FOR THE AIRCRAFT :
- DAMAGE TO EQUIPMENT CAN OCCUR IF YOU OPERATE THE ENGINE.
- THE TEST AFTER THE INSTALLATION WILL TELL YOU THE ENGINE CONFIGURATION IS NOT CORRECT AND MORE WORK WILL BE NECESSARY.

CAUTION : MAKE SURE THE FAN COWL DOORS AND THE THRUST REVERSER ARE THE CORRECT CONFIGURATION FOR THE ENGINE YOU PLAN TO INSTALL, OR DAMAGE TO THE FAN COWL DOORS, THE THRUST REVERSER OR THE ENGINE CAN OCCUR.

(1)Position trolley SMIG 277ETT so that chains are directly above hoist rings.
(2)Install dynamometers and hook cradle to chains.
(3)Check the warning values are set to 2350 daN. (5280 lbf.) for each forward dynamometer and 1100 daN (2470 lbf.) for the aft dynamometer.

WARNING : MAKE SURE THAT DURING ENGINE RAISING PROCEDURE THE STIRRUPS OF REAR BEAM CABLE DO NOT JAM IN THE PULLEYS.
FOR THIS PURPOSE MAKE CERTAIN THAT CABLE LENGTH IS EQUAL ON EITHER SIDE OF THE BOOSTRAP.

(4)Raise engine/cradle with hoists, always keeping frame horizontal, until forward and aft engine mount alignment pins engage into pylon beams.
When lifting the assembly, a variation of 300 daN (675.6 lbf) maximum is allowed forward, between the two dynamometers.
Maintain both surfaces parallel and continue to progressively lift engine/cradle until both faces are almost in contact. Read value F on dynamometers :



Aft Fairing Nozzle Seal
Figure 424

(5)Continue to apply load to obtain reading of :
- forward dynamometers : F + 150 daN (337.8 lbf)
- aft dynamometer : F + 100 daN (225 lbf)
(Ref. Fig. 421).

(6)Install engine on pylon beam. (Ref. Fig. 421)
(a)Install four bolts and retainers downward through pylon beam and engine mount. Install washers and nuts.
(b)Install four engine aft mount bolts and washers through pylon beam into engine mount.

(7)Tighten bolts, alternating from forward to aft engine mounts, until engine mounts are flush with pylon beams.

(8)Alternately, TORQUE one bolt on each engine mount and on each side of the engine : 360 - 400 lbf.ft. (48.80 - 54.2 m.daN). Torque all eight (8) mounts bolts to this requirement. Wirelock aft mount bolts with corrosion-resistant steel wire MS20995-C47.

(9)Position upper retainer over bolt head and lower retainer under nut and install bolts, washers, and nuts. TORQUE nuts to between 20 and 25 lbf. in. (0.22 and 0.28 m.daN).

(10)Remove pins from movable fittings of cradle and lower with hoists (Ref. Fig. 420)

(11)Install cradle on trolley, install pins and clear the trolley aft of engine.

(12)Remove dynamometers and hoists from bootstrap.

(13)Remove rear booststraps (Ref. Fig. 418)
(a)Remove cable (7).
(b)Remove pins (6) and free arms (4) and (5).
(c)Remove pins (2) and free main beam (1).

(14)Remove front bootstrap (Ref. Fig. 417)
(a)Remove pins (11) and arms (10).
(b)Remove wing nuts (8) and bolts (7). Remove beam (6).
(c)Remove bolts (3), plate and support channel (1).

(15)Remove tool 98A71101502000.
(a)Engage fan cowl hold open rod in engine.
(b)Remove tool 98A71101502000 remaining on fan cowl which is normally secured (Ref. Fig. 419)
(c)Remove item Detail D (Ref. Fig. 419) from fitting of fan thrust reverser cowl.

F. Installation by Means of Hydraulic Positioner (Ref. Fig. 420, 421, 422) (Ref. Fig. 424)

WARNING : DURING LIFTING AND LOWERING BRAKES SHALL NOT BE APPLIED TO HYDRAULIC POSITIONER WHEELS.
WHEN TRAILING EMPTY POSITIONER ALWAYS KEEP IT AS LOW AS POSSIBLE AND DRIVE AT VERY SLOW SPEED, ESPECIALLY ON BAD ROADS.

NEVER FORGET TO REMOVE RATCHETS FROM RATCHET WHEEL.

GENEROUSLY APPLY GRAPHITE GREASE TO SUPPORTING PADS OF RAILS.

ALWAYS OBSERVE THAT FRONT AND REAR FITTINGS DISENGAGE FROM ADAPTER, WHEN LOWERING POSITIONER, OTHERWISE THERE IS A GREAT

RISK OF RETAINING RAILS AND BENDING ADJUSTMENT SCREWS.

ALWAYS REMOVE FOUR LOCATING SCREWS BEFORE ADJUSTING RAILS CENTER LINE WITH TWO SIDE ADJUSTING SCREWS. ALWAYS INSTALL THESE FOUR SCREWS BEFORE TRAILING POSITIONER.

WHEN LOWERING POSITIONER ALWAYS MAKE SURE THAT THE FOUR RATCHETS ARE COMPLETELY FREE, IF NOT STOP MOVEMENT IMMEDIATELY.
PUMP UP AGAIN, LIBERATE RATCHETS, AND LOWER AGAIN.

CAUTION : DO A CHECK OF THE ENGINE DATA PLATE TO MAKE SURE THAT THE ENGINE IS CORRECT FOR THE AIRCRAFT.
IF YOU INSTALL AN ENGINE THAT DOES NOT HAVE THE CORRECT CONFIGURATION FOR THE AIRCRAFT :
- DAMAGE TO EQUIPMENT CAN OCCUR IF YOU OPERATE THE ENGINE.
- THE TEST AFTER THE INSTALLATION WILL TELL YOU THE ENGINE CONFIGURATION IS NOT CORRECT AND MORE WORK WILL BE NECESSARY.

CAUTION : MAKE SURE THE FAN COWL DOORS AND THE THRUST REVERSER ARE THE CORRECT CONFIGURATION FOR THE ENGINE YOU PLAN TO INSTALL, OR DAMAGE TO THE FAN COWL DOORS, THE THRUST REVERSER OR THE ENGINE CAN OCCUR.

(1)Procedure with engine to pylon preloading (recommended procedure).

NOTE : Hydraulic positioner must be equipped with load measurement device which can give the load repartition (forward and aft position), and warning to prevent the overload.

(a)Install engine and cradle (S277CR4000) assembly on hydraulic positioner (SMIG277HP) or equivalent (Ref. Fig. 422).
(b)With a plumb line and a piece of chalk project center line of nacelle on ground.
(c)With towbar directed towards, make a long approach with trailing edge and align engine center line with chalk mark.
(d)Stop hydraulic positioner when engine mounts are straight below pylon fittings.
(e)Unlock the eight clamps of rollers and shake them to make sure that they are free.
(f)Remove the four locating screws on supporting pads of the hydraulic positioner.
(g)Remove the eight ball lock pins from rollers and retain.
(h)Check indicators for correct operation. On both indicators read value F shown.
(i)Set warning value as follows :
- Forward indicator : F + 300 daN (675 lbf.)
- Aft indicator : F + 200 daN (450 lbf.)

NOTE : Use the form bolts of forward engine mount as guides when lifting engine.

(j)Install four bolts and washers in engine forward mount (Ref. Fig. 421).
(k)With one man at each hydraulic pump raise engine evenly (observe fluid levels).
(l)One man on each side shall observe that engine is clear of cowls whilst raising.

CAUTION : WHEN HOISTING ENGINE, MAKE CERTAIN REAR FAIRING SEAL AND SPRINGS, IF INSTALLED, ARE POSITIONED CORRECTLY ON ENGINE NOZZLE (Ref. Fig. 424).

(m)Continue to raise engine until centering spigot and four mount bolts of forward mount and the two centering spigots of aft mount are correctly engaged.

CAUTION : USE DEVICE WITH EXTREME CARE WHEN RAISING ENGINE TO FINAL POSITION OR DAMAGE TO MOUNTS AND PYLON COULD RESULT.

(n)Slow down engine raising.
Check carefully that during approach, engine and pylon forward and aft mount mating surfaces remain always parallel.

(o)Monitor the load indicators and raise the positioner with extreme care until the warning values are reached.

(p)Install nuts on engine forward mount bolts and aft mount bolts and washers (Ref. Fig. 421).

(q)Alternately, tighten eight bolts (one bolt at forward and aft mount on each side of engine).

(r)Alternately, TORQUE one bolt on each engine mount and on each side of the engine : 360 - 400 lbf. ft. (48.80 - 54.2 m.daN). Torque all eight (8) mounts bolts to this requirement. Wirelock aft mount bolts with corrosion-resistant steel wire MS9226-05.

(s)Position upper retainer over bolt head an lower retainer under nut and install bolts, washers, and nuts. TORQUE nuts to between 20 and 25 lbf. in. (0.22 and 0.28 m.daN).

(t)Make certain that front and rear fitting safety ball lock pins are removed and that the eight ball lock pins and eight clamps are removed and free.

(u)Unlock the front and rear jack ratchets. Apply a slight hydraulic pressure at both front and rear pumps. Make certain that ratchets are disengaged.

WARNING : BEFORE LOWERING PUMP ONE OR TWO STROKES UP BEFORE UNLOCKING AND RELEASE OIL RETURN.

(v)Lower the hydraulic positioner gradually and evenly (observe fluid levels). One man one each side shall observe that there is no interference with engine during lowering.

(w)Align the two rails with adjusting screws and install the four locating screws and ball lock pins.

(x)Lower hydraulic positioner sufficiently to be pulled away from aircraft towards wing trailing edge.

(y)Remove fittings from engine. Install and secure fittings on cradle (S277CR4000) (Ref. Fig. 420).

(z)Remove tool 98A71103511000 and maintain fan cowl doors open by means hold open rods.

(2)Procedure with gap between engine and pylon (alternate procedure).

(a)Install engine and cradle (S277CR4000) assembly on hydraulic positioner (SMIG277HP) or equivalent (Ref. Fig. 422).

(b)With a plumb line and a piece of chalk project center line of nacelle on ground.

(c)With towbar directed towards, make a long approach with trailing edge and align engine center line with chalk mark.

(d)Stop hydraulic positioner when engine mounts are straight below pylon fittings.
(e)Unlock the eight clamps of rollers and shake them to make sure that they are free.
(f)Remove the four locating screws on supporting pads of the hydraulic positioner.
(g)Remove the eight ball lock pins from rollers and retain.

NOTE : Use the form bolts of forward engine mount as guides when lifting engine.

(h)Install four bolts and washers in engine forward mount (Ref. Fig. 421).
(i)With one man at each hydraulic pump raise engine evenly (observe fluid levels).
(j)One man on each side shall observe that engine is clear of cowls whilst raising.

CAUTION : WHEN HOISTING ENGINE, MAKE CERTAIN REAR FAIRING SEAL AND SPRINGS, IF INSTALLED, ARE POSITIONED CORRECTLY ON ENGINE NOZZLE (Ref. Fig. 424).

(k)Continue to raise engine until centering spigot and four mount bolts of forward mount and the two centering spigots of aft mount are correctly engaged.

CAUTION : USE DEVICE WITH EXTREME CARE WHEN RAISING ENGINE TO FINAL POSITION OR DAMAGE TO MOUNTS AND PYLON COULD RESULT.

(l)Slow down engine raising.
Check carefully that during approach, engine and pylon forward and aft mount mating surfaces remain always parallel.
(m)Continue to raise engine slowly until a gap of 6 mm (1/14 in.) is left.
(n)Install nuts on engine forward mount bolts and aft mount bolts and washers (Ref. Fig. 421).
(o)Alternately, tighten eight bolts (one bolt at forward and aft mount on each side of engine).
(p)Alternately, TORQUE one bolt on each engine mount and on each side of the engine : 360 - 400 lbf. ft. (48.80 - 54.2 m.daN). Torque all eight (8) mounts bolts to this requirement. Wirelock aft mount bolts with corrosion-resistant steel wire MS9226-05.
(q)Position upper retainer over bolt head an lower retainer under nut and install bolts, washers, and nuts. TORQUE nuts to between 20 and 25 lbf. in. (0.22 and 0.28 m.daN).
(r)Make certain that front and rear fitting safety ball lock pins are removed and that the eight ball lock pins and eight clamps are removed and free.
(s)Unlock the front and rear jack ratchets. Apply a slight hydraulic pressure at both front and rear pumps. Make certain that ratchets are disengaged.

WARNING : BEFORE LOWERING PUMP ONE OR TWO STROKES UP BEFORE UNLOCKING AND RELEASE OIL RETURN.

(t)Lower the hydraulic positioner gradually and evenly (observe fluid levels). One man one each side shall observe that there is no interference with engine during lowering.

(u)Align the two rails with adjusting screws and install the four locating screws and ball lock pins.
(v)Lower hydraulic positioner sufficiently to be pulled away from aircraft towards wing trailing edge.
(w)Remove fittings from engine. Install and secure fittings on cradle (S277CR4000) (Ref. Fig. 420).
(x)Remove tool 98A71103511000 and maintain fan cowl doors open by means hold open rods.

G. Close-Up
(1)Connect pylon interface hoses and tubing as follows : (Ref. Fig. 415)
(a)Remove protective covers from pressure sense hoses and pylon interface fittings. Connect forward hose coupling to fitting and TORQUE to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN) and aft pressure sense hose coupling to fitting and TORQUE to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).
(b)Remove protective covers and connect pressure sense hose to fan air valve. TORQUE coupling to between 180 and 200 lbf. in. (2.03 and 2.26 m. daN).
(c)Remove protective covers from pylon drain hose and pylon interface fitting and connect hose coupling to fitting. TORQUE coupling to between 450 and 500 lbf.in. (5.08 and 5.65 m.daN).
(2)Connect pylon bleed air duct as follows :
(a)Remove protective covers from ducts, apply lubricant, Material No.P06-013, to inner surface of coupling and install coupling on bleed air duct assembly and pylon bleed air duct flanges.
(b)Mating flanges offset misalignment shall not exceed 0.06 inch (1.52 mm) maximum and angular mismatch gap shall not exceed 0.06 in. (1.52 mm).
(3)Remove protective covers and connect sense hose to pneumatic pressure regulating valve. TORQUE coupling to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).
(4)Attach left and right forward circumferential latch straps to center latch strap (mounted at top of engine fan case) as follows :
(a)Remove clevis pins, washers, and cotter pins from left and right strap and discard used cotter pins.
(b)Position left and right straps and attach to center strap by inserting clevis pins through each clevis and link, then installing washers and new cotter pins. (Ref. Fig. 413)
(5)Remove protective covers from thrust reverser sense hoses and unions in bracket and connect couplings to unions in brackets outboard of splitter gearbox at top of fan case.
CAUTION : PREVENT HOSES FROM TWISTING WHILE TIGHTENING TO SPECIFIED TORQUE.
TORQUE couplings to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

(6)Connect nacelle core compartment cooling pneumatic tube.
(a)Remove protective covers and apply anti-seize compound, Material No.P06-020 to threads of coupling nuts.

(b)Install coupling nut of hose (1) on elbow (2) (Ref. Fig. 414) and TORQUE coupling nut to between 170 and 200 lbf.in. (1.92 and 2.26 m. daN).

(7)Install main fuel supply hose (Ref. 73-12-04, P. Block 401).

(8)On engine 1 only, remove blanking plug/cap from hydraulic pressurization line restrictor and connect to 15th stage port (Ref. Fig. 415). TORQUE hose coupling to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

CAUTION : IF ENGINE IS BEING INSTALLED IN NUMBER TWO POSITION ON THE AICRAFT, INSTALL CAP ON HYDRAU-PRESSURIZATION PORT ON PNEUMATIC DUCT.

(9)Connect hydraulic hoses at pylon interface, right side, as follows : (Ref. Fig. 412)

(a)Remove protective covers from hydraulic hoses and pylon interface ports and connect suction hoses to pylon interface with self-sealing couplings using PWA86156 wrench.

(b)Connect two case drain hoses to upper center fittings in pylon junction box and TORQUE couplings to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN) using PWA86156 wrench.

(c)Apply hydraulic fluid, Material No.P02-001, to hydraulic pumps pressure hose couplings, connect couplings to junction box fittings, and TORQUE couplings to between 1200 and 1400 lbf.in. (13.56 and 15.82 m.daN).

CAUTION : TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(10)Remove protective covers and connect generator power lead electrical connector D4955P to pylon receptacle above engine core, left side. Tighten connector handtight plus one-eighth turn. (Ref. Fig. 405)

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

(10)Not applicable.

**ON A/C 101-200,

(11)Remove protective covers and connect electrical connectors D4961P, D4971P, D4954P, D4952P rearward of D4956P and D4958P to pylon electrical connector panel. Tighten connectors handtight plus one-eighth turn.

NOTE : If a shunt is installed between pins E and F of receptacle 1853VC (1854VC), proceed as follows :
- Open, safety and tag circuit breaker 1ES(2ES)
- Remove shunt
- Remove protective cover and connect connector D4956P
- Remove safety clip and tag and close circuit breaker 1ES(2ES).

NOTE : Be sure you connect the proper connector to the proper receptacle.
The D4952P connector/receptacle is rearward of the D4956P connector. Use the color codes on the connector and receptacle if equipped.

(12)Install electrical connectors on engine left side.
NOTE : Be sure you connect the proper connector to the proper receptacle. Use the color codes on the connectors and receptacles if equipped.
(a)Remove protective covers and connect electrical connectors (from front to rear) D4998P, D4999P, W2P14 and W1P14 to left forward pylon junction box. Tighten connectors handtight plus one-eighth turn.
(b)Install clamps (1) on brackets (Ref. Fig. 410).
NOTE : Install clamps (1) as shown on figure. An incorrect installation could result in electrical harness chafing.
(c)Connect electrical connectors D5018P, D4986P and D5003P to bracket and left thrust reverser junction box. Tighten connectors handtight plus one-eighth turn.
(d)Connect electrical connector D5055P and attach 21W4068 harness to other harness with a string tie (Ref. Fig. 407).
(13)Install electrical connectors on engine right side.
NOTE : Be sure you connect the proper connector to the proper receptacle. Use the color codes on the connectors and receptacles if equipped.
(a)Remove protective covers and connect electrical connectors D4989P, D4953P, D4966P, D4970P, D4963P, and D4967P to right forward pylon junction box.
(b)Install clamp (1) on bracket (Ref. Fig. 409).
NOTE : Install clamp (1) as shown on figure. An incorrect installation could result in electrical harness chafing.
(c)Connect electrical connectors D5008P, D4987P and D5019P to brackets. Tighten all connectors handtight plus one-eighth turn.
(d)Connect electrical connector D5054P and attach 21W4068 harness to other harness with a string tie (Ref. Fig. 407).
(14)Not applicable.

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

(14)Connect the IDG wire harness (Ref. Fig. 411).
(a)Remove the harness from the left thrust reverser.
(b)Position the grommets onto the five quick disconnect clamps. Close and secure the five clamps.
(c)Install the guide and the bracket (4) onto the engine bracket with the two bolts (5) the washers and nuts. TORQUE the bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN). Attach the clamp to the bracket (4) with the bolt (3) and nut. TORQUE the bolt to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(d)Position the 070001-00N and 070002-00N wire terminal lugs onto the engine bracket. Secure the wires with the bolt (6), washer, lockwasher and nut. TORQUE the bolt to between 95 and 115 lbf.in. (1.08 and 1.29 m.daN).
(e)Attach the harness lugs to the four IDG terminal block N, T3, T2, T1 with square washers (lugs up), washers and nuts (2) or captive

nuts/washers (2). TORQUE the four nuts (2) to between 144 and 168 lbf.in. (1.63 and 1.89 m.daN).

(f)Position the terminal cover onto the IDG terminal block and secure with two washers and screws (1). TORQUE the screws (1) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(g)Rig the harness position and check the clearances with the adjacent pylon, structure, harness, bracket and duct.

**ON A/C 101-200,

(15)Remove protective caps and plugs. Reconnect fire extinguisher hose to the pylon interface fitting. TORQUE to between 450 and 500 lbf.in. (5.08 and 5.65 m.daN). (Ref. Fig. 402)

(16)Install grounding strips attaching nose cowl to right and left pylon junction boxes.

(17)Lubricate fan case and engine V-grooves and thrust reverser door V-blades (Ref. 71-13-03, P. Block 201).

(18)Bleed engine fuel system (Ref. Fig. 403).

(a)Energize the aircraft electrical network (Ref. 24-41-00, P. block 301).

(b)Make certain that electronics racks ventilation is correct.

(c)Place a container under the fuel pump and remove the drain plug at FD3 filter cover.

(d)Place the corresponding HP fuel shut-off valve control lever in ON position.

(e)Make certain that fire handles are in pushed position (normal).

(f)Close circuit breakers 1KC, 2KC, 3KC and 4KC.

(g)On panel 430VU set the corresponding pump in operation.

(h)Bleed fuel system until the flow is regular at drain outlet port.

NOTE : It is important that after shut-off the aircraft boost pump, the drain plug must be installed immediately to minimize air entering the fuel system after priming.

(i)Stop pump operation.

(j)Install plug and safety with lockwire dia. 0.8 mm (0.032 in.).

(k)Check unions for leakage.

(l)Place HP fuel shut-off valve control lever in OFF position.

(19)Bleed pump case of engine driven hydraulic pumps (Ref. 29-11-32, P. Block 401).

(20)Fill Engine Oil System (Ref. Fig. 425, 426).

(a)Turn handle on oil tank cap 45 degrees counter clockwise to unlock cap.

(b)Inspect oil tank cap packing to make certain it is free of cuts and shows no evidence of deterioration.

(c)Fill tank with new oil, Material No.P03-001. Check oil level indicator on tank with a light source to determine oil level. A dark indication means oil level is satisfactory. A reflected light indication means oil level is more than one quart low.

(d)Close cap. Turn handle 45 degrees clockwise to lock cap.

(21)Fill starter oil system (Ref. 12-13-80, P. Block 1).

(22)Check I.D.G lubrication system (Ref. 12-13-24 P. Block 1).

(23)Do a check of the primary electrical bonding between the pylon structure and the engine.

(a)Measure the resistance value (ohmic) (Ref. 20-28-11, P. Block 1).

Make sure that the resistance between the engine and the pylon is not more than 1.5 milliohms.

(24)Remove the warning notices, remove safety clips and tags and close all circuit breakers (Ref. 71-13-00, P. Block 301).

(25)Dry motoring (Ref. 71-00-00, P. Block 501).

(26)Top up I.D.G lubrication system (Ref. 12-13-24, P. Block 1).

(27)Top up engine oil system (Ref. 12-13-79, P. Block 1).

(28)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(29)Remove tool 98A7110325000 from thrust reverser door opening actuator (Ref. Fig. 401).

(30)Close thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(31)Check closing force for lower bifurcation latches. (Must be between 50 and 60 pounds (22.24 to 26.69 daN) at tip of handle). If necessary, adjust (Ref. 71-13-03, P. Block 501).

(32)Check closing force for forward circumferential latch. (Must be between 45 and 55 pounds (20.02 - 24.47 daN) at tip of handle. If necessary, adjust (Ref. 71-13-03, P. Block 501).

(33)Check closing force for aft circumferential latch. (Must be between 70 to 80 pounds (31.08 to 35.59 daN) measured at 0.25 in. (6.35 mm) from end of handle). If necessary, adjust per (Ref. 71-13-03, P. Block 501).

(34)Toggle latch system : check closing force required to overcenter toggle in receptacle. (Must be between 30 and 50 lbf (13.32 and 22.2 daN) at tip of handle. If not, adjust (Ref. 71-13-03, P. Block 501).

NOTE : Perform adjustment of thrust reverser cowl doors in its entirety (Ref. 71-13-03, P. Block 501) if either :
- one closing force at least is incorrect or
- one thrust reverser cowl door at least has been removed.

R (35)Adjust thrust reverser main drive cable.

R NOTE : The following procedures assume that the replacement power plant will be equipped with a PDU rigged to NOMINAL DEPLOY position. (For PDU rigging procedure (Ref. 78-31-01, P. Block 401).

R NOTE : Left and right sleeves must first be synchronized in full STOW position and interfaced at splitter gearbox. Primary brake handle on PDU must be ON (fully retracted).

R WARNING : KEEP ALL PERSONNEL CLEAR OF REVERSER SLEEVES DURING STOW AND DEPLOY CYCLES.

R (a)Disconnect primary drive cable from PDU.

R (b)Manually, unlock the synchronous shaft lock assembly.

R (c)Position sleeves at full STOW by cranking with a socket drive inserted in lower hex of master actuator. Make sure each actuator forward stop is engaged and holdoff resistance of sleeve lip seals is overcome.

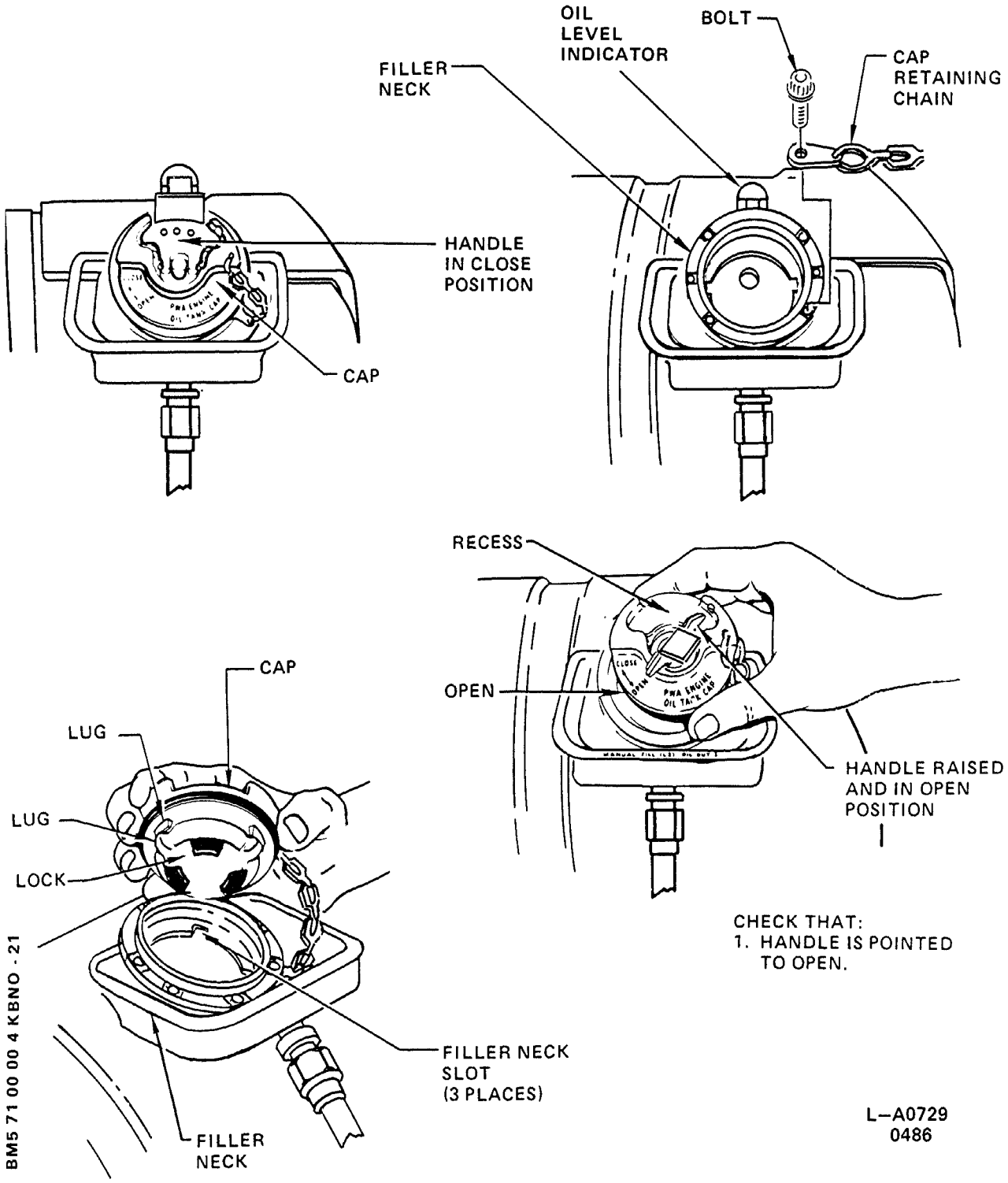
R (d)With sleeves held in this position, install the drive cables between the master actuators and the splitter gearbox.

R (e)Manually release both master actuator secondary locks by pulling on handle and wedge in that position.

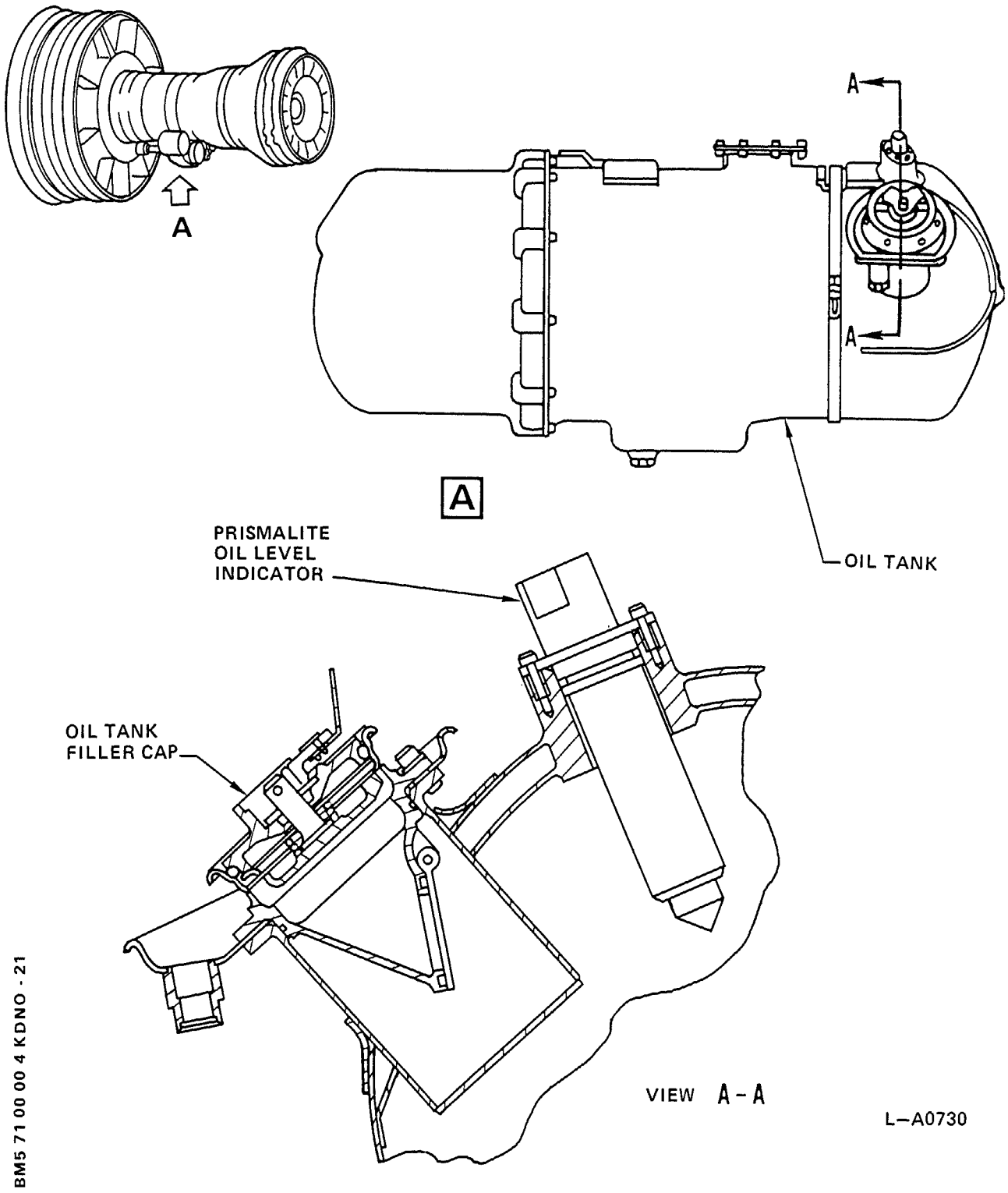
R (f)Using the main drive cable, extend sleeves to NOMINAL DEPLOY, which is 7 1/2 turns from the FULL AFT STOP DEPLOY position. Hold this position at the master actuators to prevent sleeves from drifting.

R (g)Manually release the PDU brake by pulling on handle and wedge in that position.

R (h)Reconnect primary drive cable to PDU with washers and screws. TORQUE screws to between 20 and 25 lbf.in. (0.226 and 0.282 m.daN). Cable may be preloaded on shaft hex flat rotation (1/6 turn), if necessary, to allow hex engagement. (Preloading will tend to move sleeve toward STOW position).
R (i)From either master actuator, drive the sleeves to the STOW position until actuator forward stops engage. Hold actuators against their forward stops and remove wedges from actuator secondary locks and PDU brake.
R (j)With sleeves in STOW, verify that gap at leading edge of sleeves is between 0.09 and 0.15 in. (2.3 and 3.8 mm).
R NOTE : A red warning band on the thrust reverser bulkhead will be visible if sleeves are not fully stowed.
R (k)Return the manual unlock lever of the synchronous shaft lock in normal position.
R (l)Perform functional check of the synchronizing shaft lock (Ref. 78-31-00, P. Block 501).
R (m)Install ground air supply hose (RSE1079) and perform operational test of thrust reverser system (Ref. 78-32-11, P. Block 501).
R (n)Repeat Step (j).
R (o)Check that PDU brake and master actuator lock handles are in the locked position.
R (p)Remove ground air supply hose (RSE1079) and install protective covers on ground air valve and starter duct ground air fitting.
R (36)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
R (37)Check the cowl doors latches (Ref. 71-13-05, P. Block 501).
R (38)Test the pneumatic system
R NOTE : Make sure that HP valve and BLEED valve are not mechanically locked and can operate freely.
R (a)Perform BITE test (Ref. 36-11-00, P. Block 501).
R (39)Perform FADEC Static Test (Ref. 71-00-00, P. Block 501, Test No. 7).
R (40)With both engines running, perform AC Essential Generation Switching Test (Ref. 24-25-00, P. Block 501).
R (41)With engines running, perform functional test of IDG Disconnect/ Reconnect function (Ref. 24-11-00, P. Block 501, Paragraph 2) or with engines static, perform operational test of IDG disconnect/reconnect function (Ref. 24-11-00, P. Block 501, Paragraph 1).
R (42)With engine running, perform operational check of engine anti-ice (Ref. 30-21-00, P. Block 501).
R (43)Test the hydraulic driven pump as per (Ref. 29-11-32, P. Block 401).
R (44)Perform engine replacement test (Ref. 71-00-00, P. Block 501, test No.10 or test No. 11).
R (45)Clean air conditioning ducts (Ref. 21-51-00, P. Block 301).
R NOTE : Cleaning of the air conditioning ducts is necessary to prevent bad smells entering the aircraft.



Engine - Servicing Oil Tank Cap Installation
Figure 425



Oil Tank - Oil Level Indicator
Figure 426

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clip
B. 98F10103500000	Chocks - Wheel
C. RSE1193	Support
or	
RSE1131	Support
D. PWA85844	Adapter
E. Material No.P05-007	Special Materials (Ref. 70-00-00)
F. Material No.P06-021	Lubricants (Ref. 70-00-00)
G.	Corrosion Resistant Steel Lockwire
Referenced Procedures	
- 12-13-79, P. Block 1	Replenishing - Engine
R - 23-44-12, P. Block 401	Maintenance Interphone Jack
- 24-41-00, P. Block 301	AC External Power Control
- 27-50-00, P. Block 301	Flaps
- 49-00-00, P. Block 501	Airbone Auxiliary Power
- 71-00-00, P. Block 201	Engine Operating Limits
- 71-13-00, P. Block 301	Cowl Doors
- 73-38-00, P. Block 501	FADEC System Indicating
- 80-11-00, P. Block 1	Control and Indicating

2. Safety Precautions and Fire Fighting Procedures - During Engine Operation

R WARNING : SAFETY AREAS MUST BE CLEAR OF PERSONNEL, EQUIPMENT TOOLS AND FOREIGN OBJECTS.

WHENEVER MAINTENANCE PROCEDURES ARE TO BE CARRIED OUT WITH ENGINE RUNNING, IT IS IMPERATIVE TO HAVE ENGINE COWLS CORRECTLY LATCHED FOR SPEEDS RANGING ABOVE FLIGHT/GROUND IDLE.

WARNING : BEFORE YOU OPERATE THE ENGINES AT POWER SETTINGS ABOVE IDLE, MAKE SURE THAT ACCESS DOOR 136AR IS OPEN. THIS IS TO MAKE SURE THAT THERE IS NO RISK OF RESIDUAL PRESSURE IN THE AIRCRAFT AFTER ENGINE SHUTDOWN.
IF PERSONNEL TRIES TO OPEN A DOOR WHEN THERE IS RESIDUAL PRESSURE IN THE AIRCRAFT :
- THE DOOR CAN OPEN WITH DANGEROUS SUDDEN FORCE
  AND
- THERE IS A RISK OF DEATH OR BAD INJURY AND DAMAGE TO THE AIRCRAFT.

WARNING : ALL SAFETY PRECAUTIONS MUST BE OBSERVED DURING ENGINE OPERATION. SUCTION AT THE AIR INLET IS SUFFICIENT TO KILL OR SERIOUSLY

INJURE PERSONNEL BY DRAWING THEM INTO OR AGAINST THE INLET. THE HIGH TEMPERATURE VELOCITY, AND OVERPRESSURE (ABOVE ATMOSPHERIC) WITHIN THE EXHAUST GAS WAKE IS ALSO EXTREMELY DANGEROUS.

CAUTION : IF POSSIBLE THE AIRCRAFT SHOULD BE HEADED INTO WIND SO THAT EXHAUST GASES ARE NOT INGESTED BY THE ENGINES.
PRIOR TO STARTING ENGINE, CHECK THAT THRUST REVERSER CONTROL LEVERS ARE IN STOWED POSITION AND THRUST REVERSERS, IF DEPLOYED, ARE FUNCTIONALLY CLEARED TO STOW.

NOTE : Special criteria/specification for use of a noise suppressor have to be defined on a case to case basis depending on the type of the noise suppression system seleted.
Operators interested in noise suppression system can be assisted by the engine manufacturer.

A. Make certain that all personnel are standing clear of the exhaust area. Refer to Paragraph 3 for hazard areas.

B. Make certain that all personnel are standing outside the hazard area forward of the inlet. Refer to Paragraph 3 for hazard areas.

C. Make certain that fuel drainage does not present a fire hazard.

D. Care must be exercised to clear away any objects liable to be blown away or ingested by the engine.

E. Landing Gear Ground Safety and Aircraft Immobilization

WARNING : MAKE SURE THAT FOR THE ENGINE GROUND RUN TEST :
- THE AIRCRAFT IS IN A CLEAR AREA SPECIFIED FOR ENGINE GROUND RUN WITH NO OBSTACLE NEARER THAN 50 METERS (164 FT) IN FRONT OF THE AIRCRAFT.
- THE AIRCRAFT IS STOPPED AND CANNOT MOVE DURING THE ENGINE GROUND RUN.
- THE FRONT GEAR STEERING HAS TO BE ACTIVE.

CAUTION : MAKE SURE THE A/C IS PARKED ON A CLEAN DRY FLAT AREA. THERE SHOULD BE NO OIL, GREASE, OR OTHER SLIPPERY MATERIAL ON THAT SURFACE. FOR ENGINE HIGH POWER GROUND RUNS, PAVEMENT MUST BE IN CONCRETE BECAUSE ASPHALT CAN CAUSE DAMAGE TO THE REAR STRUCTURE OF THE A/C AND/OR THE ENGINE NACELLES.

NOTE : Idle runs are allowed on asphalt provided it is in good condition.

(1)When operating engine at EPR ≤ 1.30, the following procedure must be applied :

WARNING : IF DURING THE ENGINE GROUND RUN TEST THE AIRCRAFT STARTS TO MOVE FORWARD :
- DECREASE THE ENGINE THRUST IMMEDIATELY.

R CAUTION : THERE MUST BE TWO QUALIFIED PERSONS IN THE COCKPIT WHEN
R PERFORMING AN ENGINE RUN. ONE MUST MONITOR THE OUTSIDE AND
R THE AIRCRAFT BEHAVIOUR WHILE THE OTHER PERFORMS THE ENGINE
R TEST.

(a)Check that landing gear ground safeties including wheel chocks P/N 98F10103500 are in position and parking brake is used. Do not exceed flight idle speed (Ref. Fig. 525) (and Ref. Table 503A) with

only one engine running. When it is necessary to increase speed, set untested engine at EPR = 1.10 to reduce airframe lateral load.

(2)When operating one engine at EPR > 1.30 the following procedure must be applied :

WARNING : CHECK THAT LANDING GEAR GROUND SAFETIES INCLUDING WHEEL CHOCKS P/N 98F10103500 ARE IN POSITION.

WARNING : DO NOT ALLOW ONE ENGINE TO RUN AT EPR > 1.30 WITH AIRCRAFT IMMOBILIZED BY MEANS OF WHEEL CHOCKS AND PARKING BRAKE (WHEEL CHOCKS AND BRAKE PEDALS MUST BE USED).

(a)Check that fuel quantity contained in inner tanks is at least equal to 8000 kg (17,700 lb.)

(b)Maintain aircraft immobilized as follows :

- on panel 401VU, place BRK/ANT SKD selector switch (96 GG) in ALT OFF position
- fully depress brake pedals and hold
- release parking brake handle
- on panel 4VU, on triple indicator (71GG), make certain that brake pressureincreases to max value > 2500 psi (175 BAR)
- perform engine ground run.

WARNING : IF DURING THE ENGINE GROUND RUN TEST THE AIRCRAFT STARTS TO MOVE FORWARD :
- DECREASE THE ENGINE THRUST IMMEDIATELY.
- STOP THE AIRCRAFT WITH THE PARKING BRAKE.

WARNING : TO REDUCE AIRFRAME LATERAL LOAD, NEVER ALLOW AN ENGINE TO RUN AT EPR > 1.30 WITHOUT THE OTHER ENGINE BEING AT A RATING OF EPR = 1.10 AND NOT EXCEEDED.

(c)Return to parking brake applied configuration :

- pull parking brake handle
- release brake pedals
- check that brake pressure decreases to normal parking brake pressure.

F. Make certain that aircraft direction is compatible with prevailing wind direction.
(Ref. Fig. 501)

G. Procedures in Case of Engine Fire on Ground

WARNING : PROCEDURE IN CASE OF ENGINE FIRE. ENGINE FIRES ARE OF TWO TYPES.
- INTERNAL FIRE
- EXTERNAL FIRE IN NACELLE

(1)Internal fire and tailpipe fires

(a)Indications.

- EGT increases rapidly when HP fuel shut off valve control lever is placed in ON position.
- Internal exhaust nozzle fire reported by ground crew.

CAUTION : FIRE EXTINGUISHING AGENTS CAN CAUSE SEVERE DAMAGE TO THE ENGINE AND THEREFORE, SHOULD ONLY BE CONSIDERED AS A LAST RESORT.

(b)Procedure

Interrupt start immediately using the following procedure :

- retard throttle control to GROUND IDLE position.
- place HP fuel shut off valve control lever in OFF position.

- place pneumatic cross feed valve pushbutton switch manually in line.

CAUTION : IF ON ENGINE PANEL 429VU, OPEN LIGHT HAS EXTINGUISHED (N2 ABOVE 45 %), WAIT UNTIL N2 DECREASES TO 20 % THEN PRESS START PUSHBUTTON SWITCH TO REENGAGE STARTER.

CAUTION : IF POSSIBLE RESPECT STARTER UTILIZATION LIMITS (Ref. 80-11-00, P. Block 1).

- place ENG IGNITION selector switch in CRANK position until any fire evidence has disappeared and motor engine for 30 seconds to clear out trapped fuel or vapor.
- place ENG IGNITION selector switch in OFF position.
- if EGT limit has been exceeded, perform engine overtemperature inspection (Ref. 71-00-00, P. Block 201).
- perform procedures following engine emergency shutdown or clear engine (Ref. 71-00-00, P. Block 201).

(c)Tailpipe fire (Ref. 70-00-00, P. Block 201, Paragraph 20.G.).

(2)External fire in nacelle with cowls closed

(a)Fire indicated by fire detection loops can be extinguished using the onboard fire extinguishing system (Ref. 26-21-00, P. Block 1).

NOTE : On the ground, when using the onboard fire extinguishing system, no delay is to be observed before using fire extinguishing bottles.

(b)If the fire is not completely extinguished by this procedure choose appropriate access to engine and extinguish fire with fire extinguisher.

CAUTION : IF FIRE EXTINGUISHER IS USED, PERFORM ENGINE APPROPRIATE INSPECTION/CHECK.

CAUTION : IF DRY CHEMICAL OR FOAM ARE USED, EXPECT CORROSION DAMAGE. IF CO2 IS USED ON HOT SECTIONS, EXPECT DAMAGE DUE TO THERMAL SHOCK.

(3)External fire in nacelle with cowls open

Do not use the onboard fire extinguishing system with cowls open. Use fire extinguishing bottles.

CAUTION : IF DRY CHEMICAL OR FOAM ARE USED, EXPECT CORROSION DAMAGE. IF CO2 IS USED ON HOT SECTIONS, EXPECT DAMAGE DUE TO THERMAL SHOCK.

(4)External exposure to fire extinguishing agents

If the engine has been exposed to fire extinguishing agents on its external surfaces, perform the following :

(a)Carbon dioxide (CO2) contamination

1 Cold sections : parts not exposed to heat require no maintenance action

2 Hot sections : parts exposed to heat at time of contamination must be removed for inspection. Refer to applicable sections.

(b)Chemical form contamination

1 Rinse exposed areas using clean running water.

2 Scrub to remove all foam agents.

(c)Dry chemical powder contamination. Clean.

3. Engine Hazard Areas

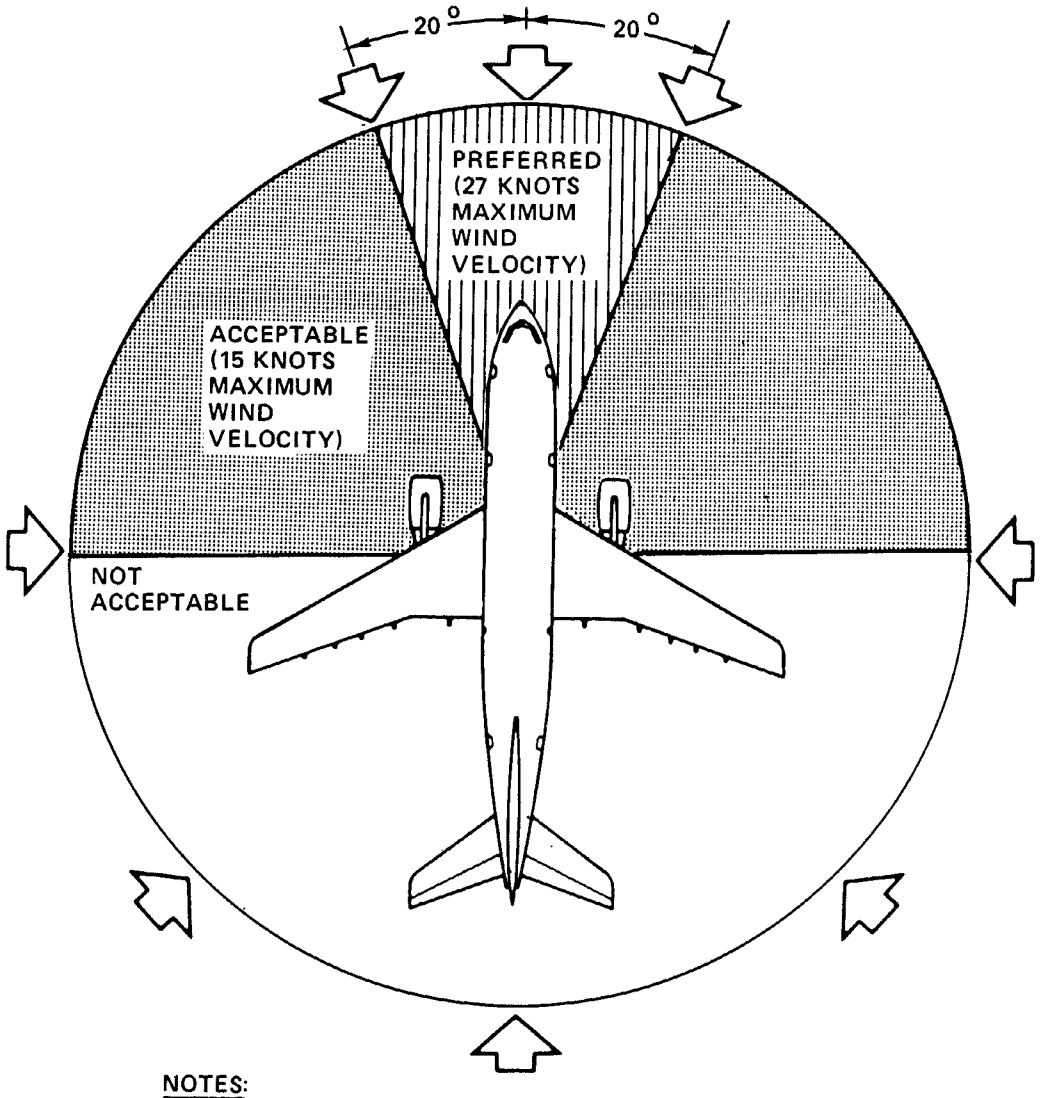
A. Temperatures

(1)Idle Power (Ref. Fig. 502).
(2)1.24 EPR (Ref. Fig. 503).
(3)Take-Off Power (Ref. Fig. 504).

B. Velocity
(1)Idle Power (Ref. Fig. 505).
(2)1.24 EPR (Ref. Fig. 506).
(3)Take-Off Power (Ref. Fig. 507).

C. Forward of Engine
(1)Idle Power (Ref. Fig. 508).
(2)Take-Off Power (Ref. Fig. 509).

D. Engine Noise Danger Areas (Ref. Fig. 510)
(1)The zones given in referenced figure necessitate the use of ear-protection headsets.



NOTES:

1. WIND VELOCITY STATED FOR STEADY WIND CONDITIONS, REDUCE MAXIMUM LIMIT 5 KNOTS FOR GUSTY WIND CONDITIONS.
2. DISCONTINUE TEST RUN IF EPR/AND OR N1 BECOME UNSTABLE OR IF INLET NOISE INTENSITY INCREASES, OR INLET SOUND CHARACTERISTIC CHANGES SUCH AS BLOWTORCH–TYPE SOUND. INCREASED ENGINE VIBRATION MAY ALSO BE NOTED.
3. RELATIVE WIND DIRECTION.

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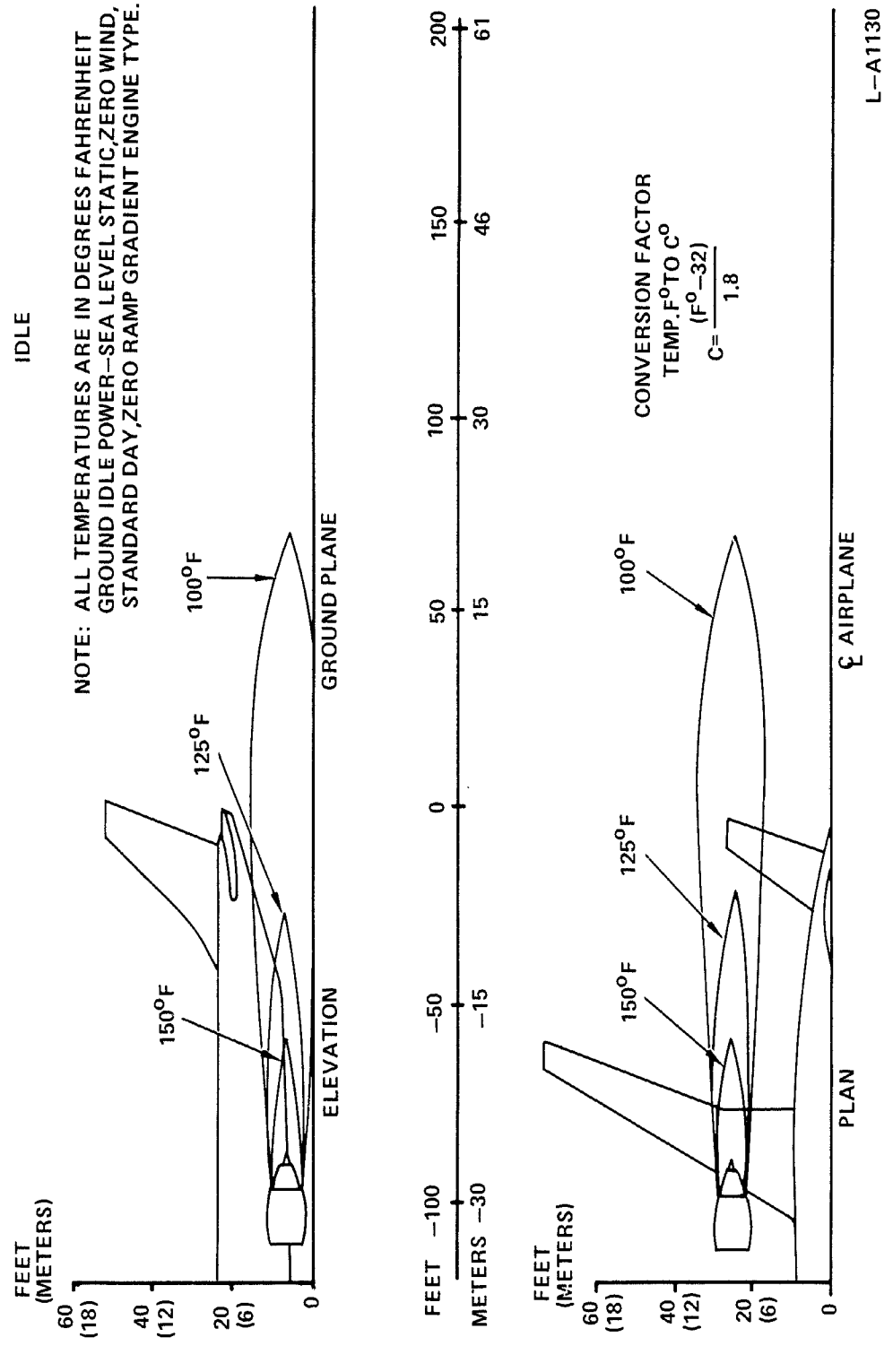
DM5

Preferred Wind Direction Engine Ground Test
Figure 501



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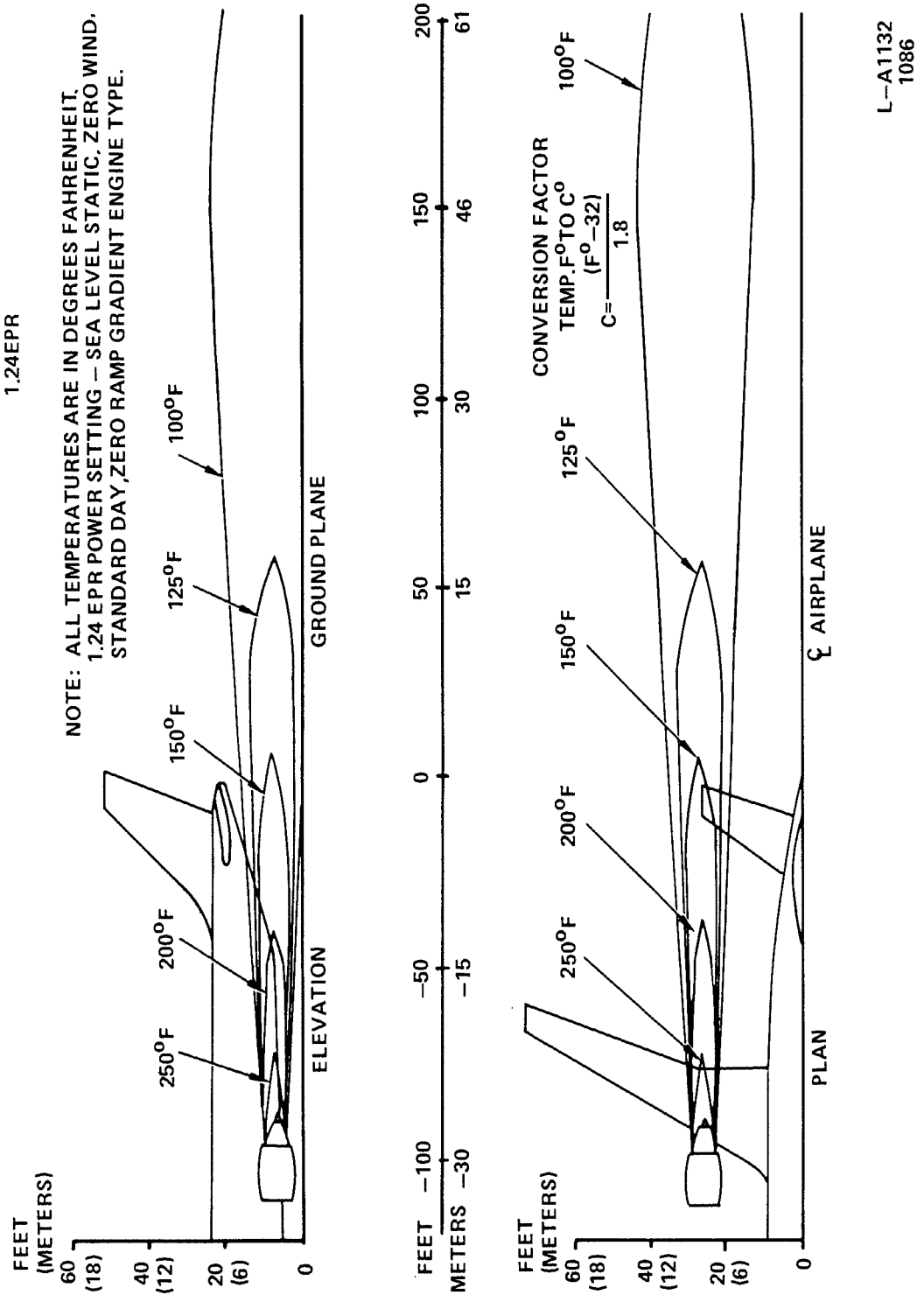
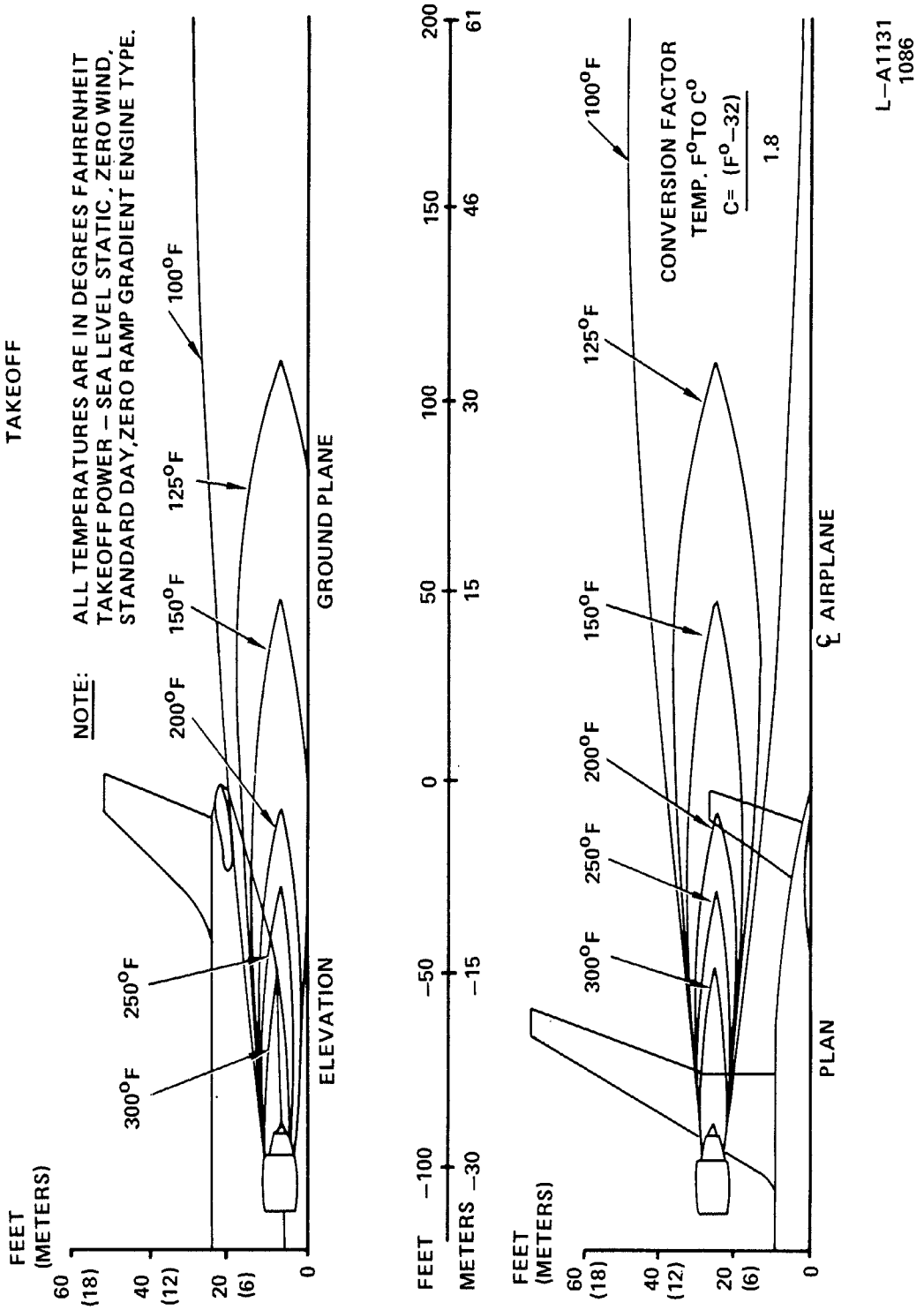
Jet Wake Diagram - Idle
Figure 502



Jet Wake Diagram - 1.24 EPR
Figure 503



Jet Wake Diagram - T.O EPR
Figure 504

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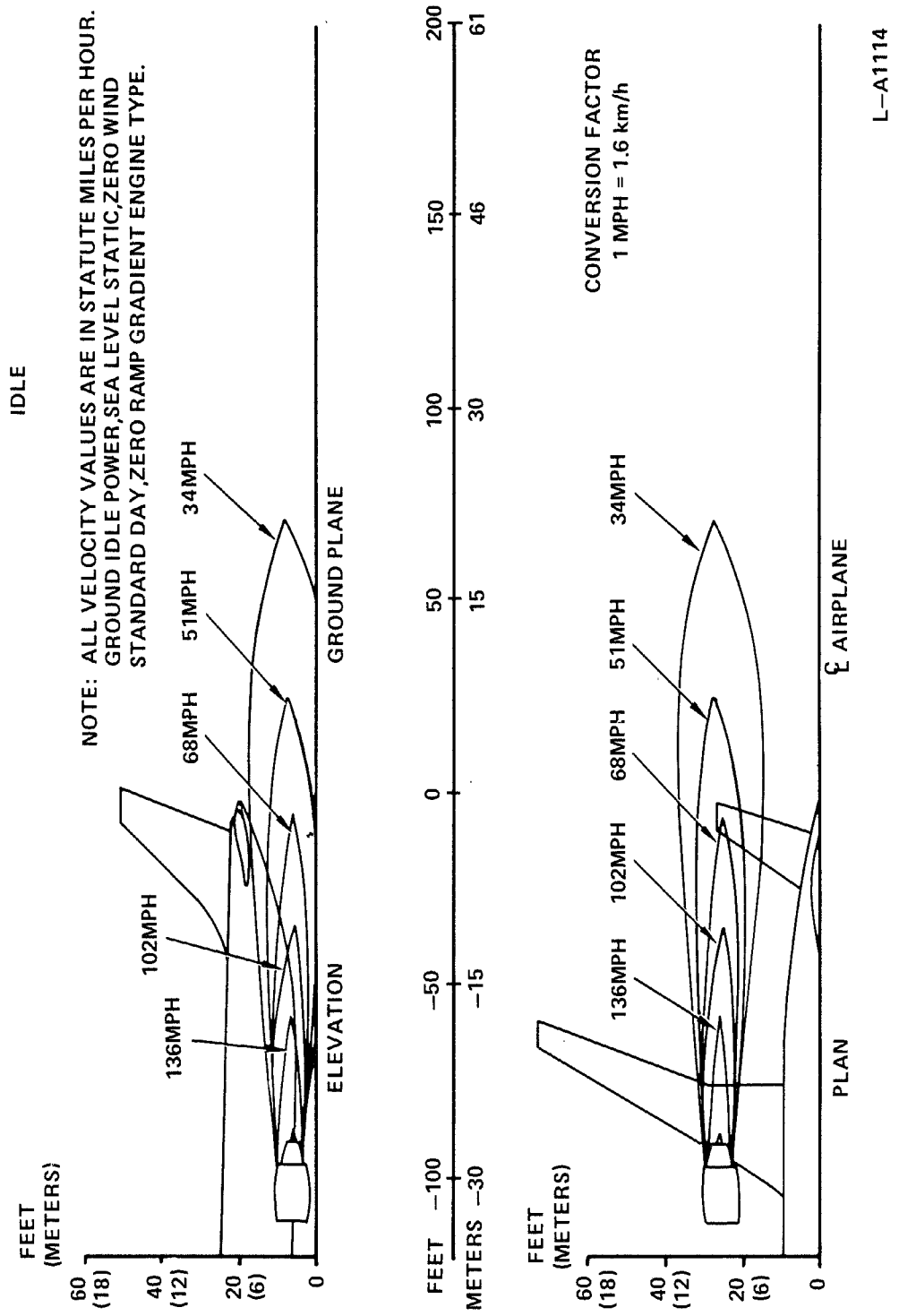

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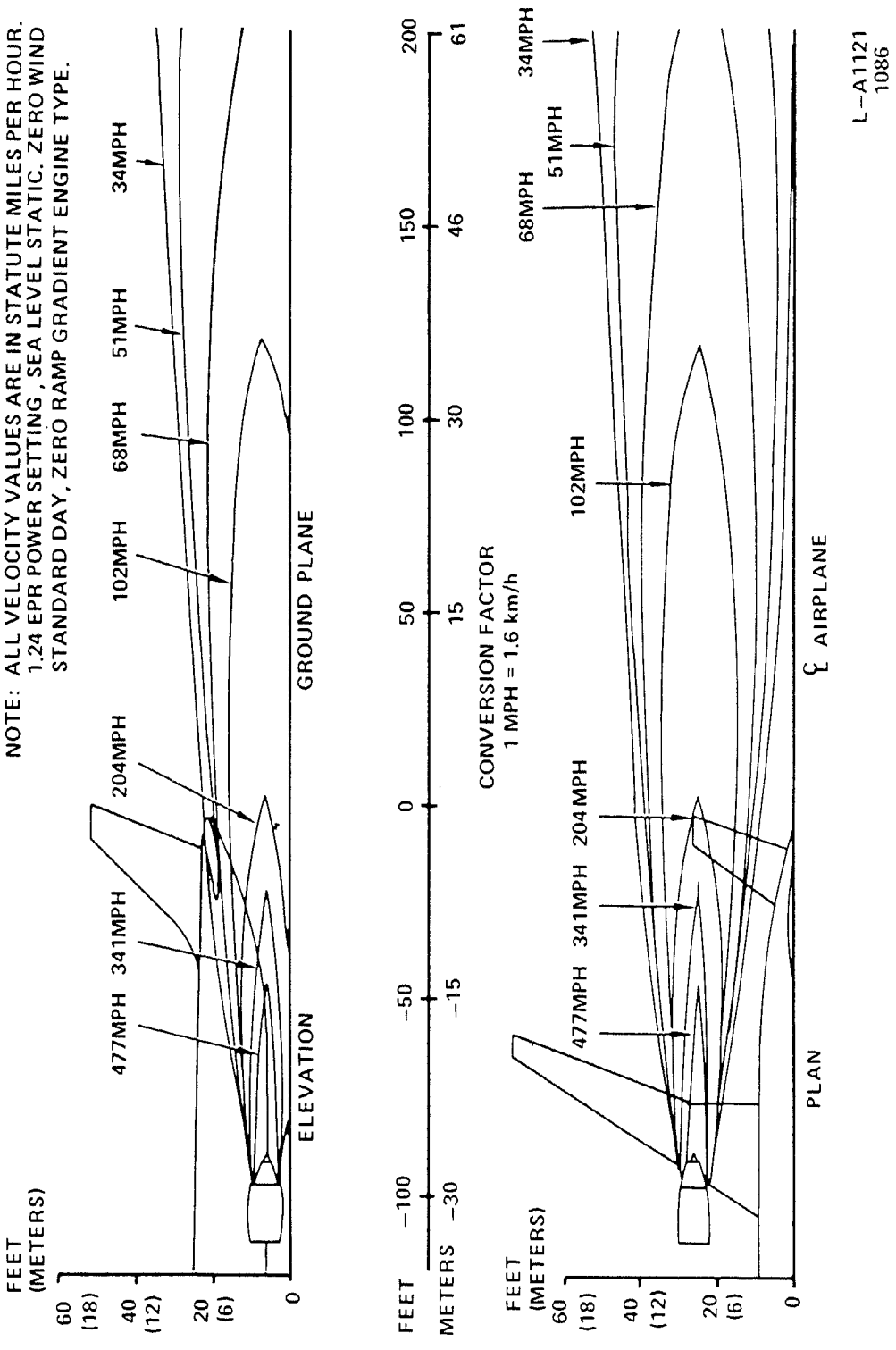
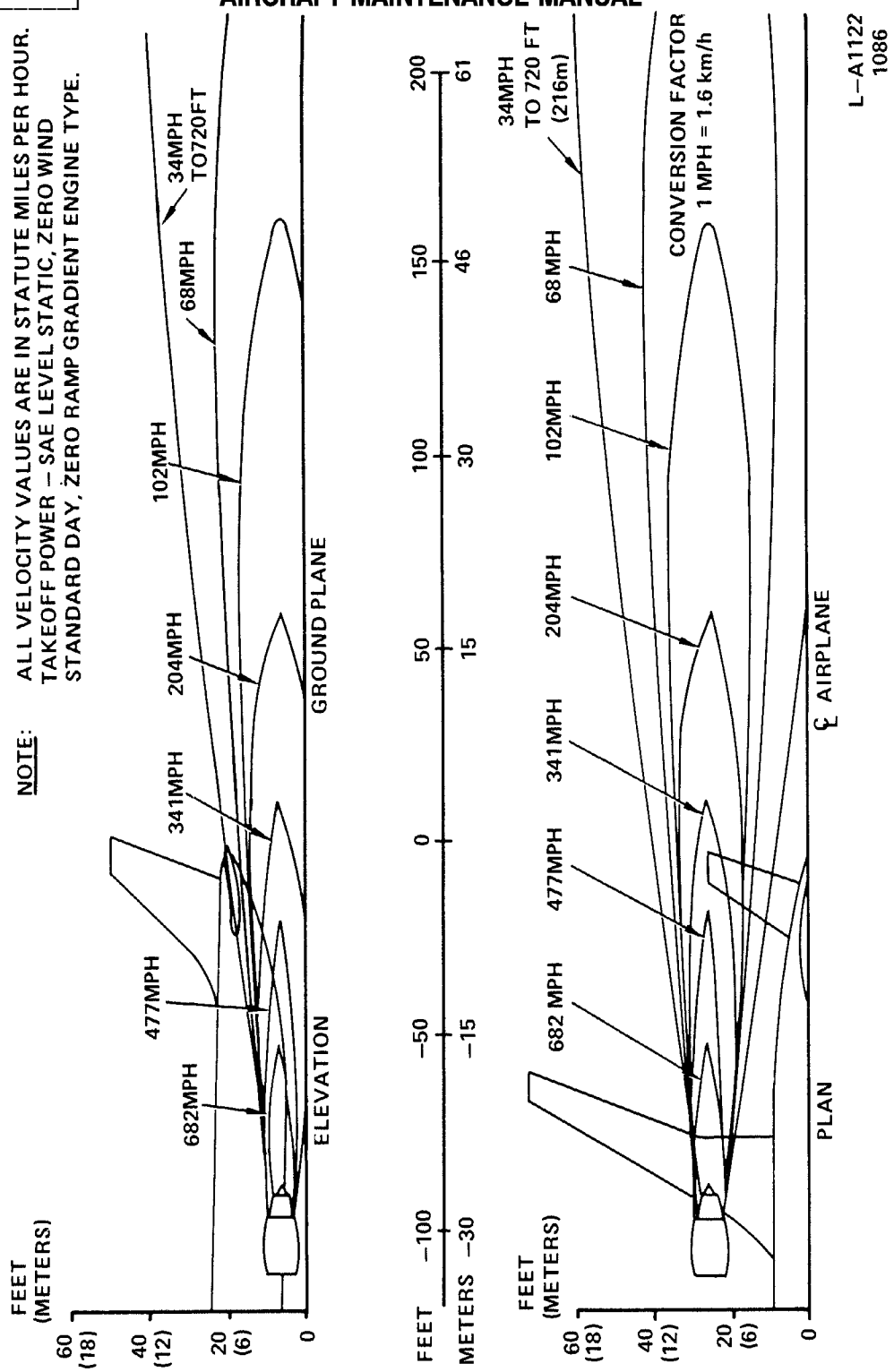
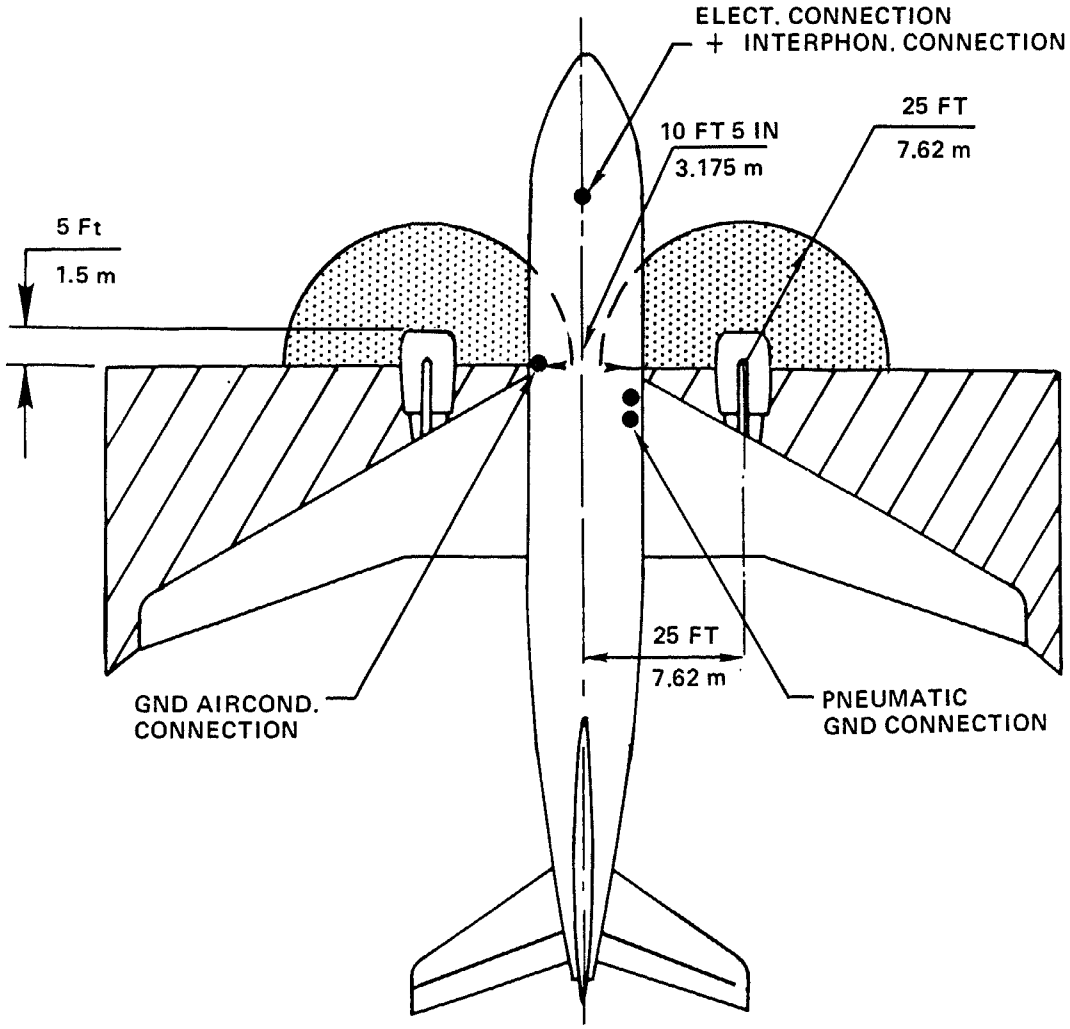
Jet Wake Diagram - Idle Thrust
Figure 505



Jet Wake Diagram - 1.24 EPR
Figure 506

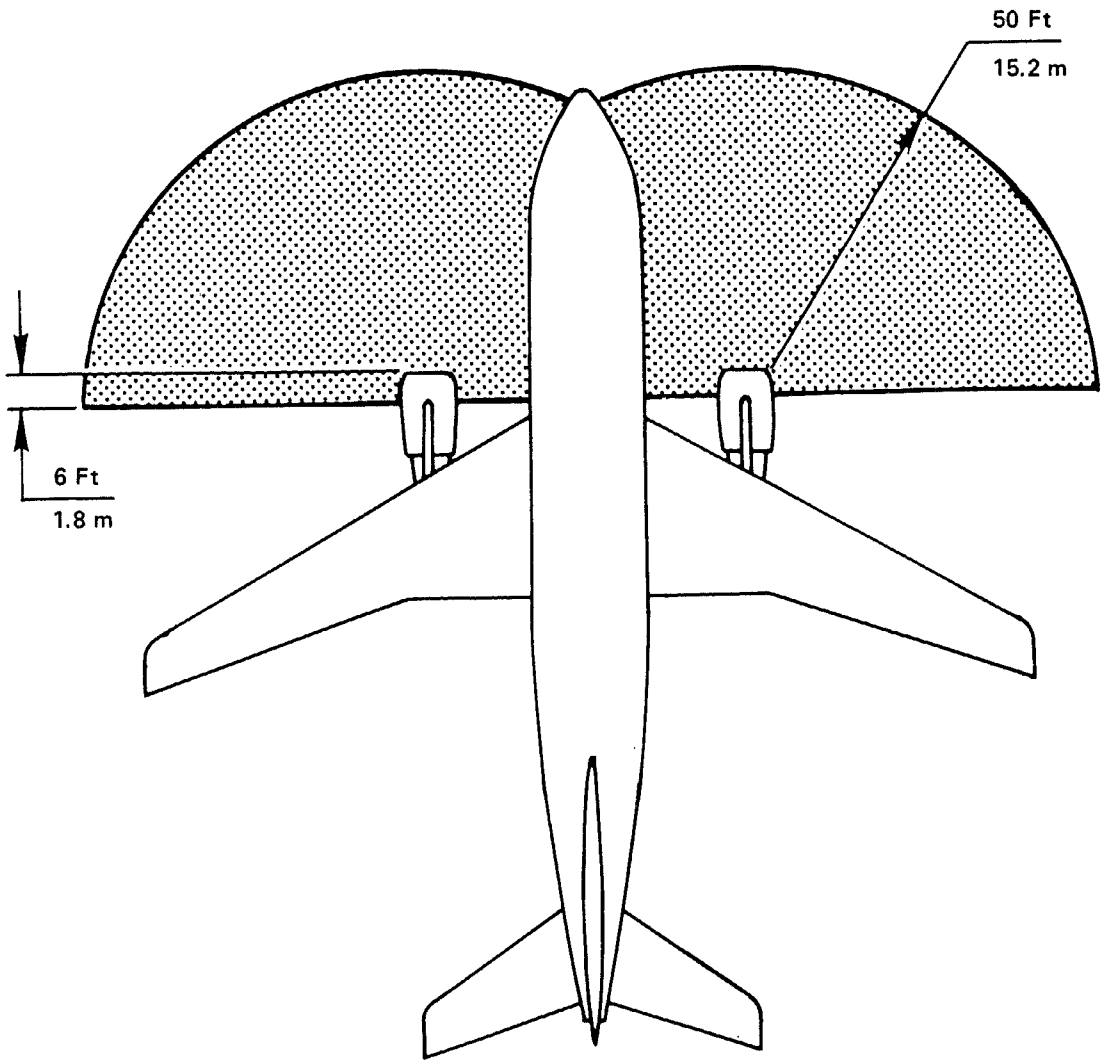


Jet Wake Diagram - T.O EPR
Figure 507



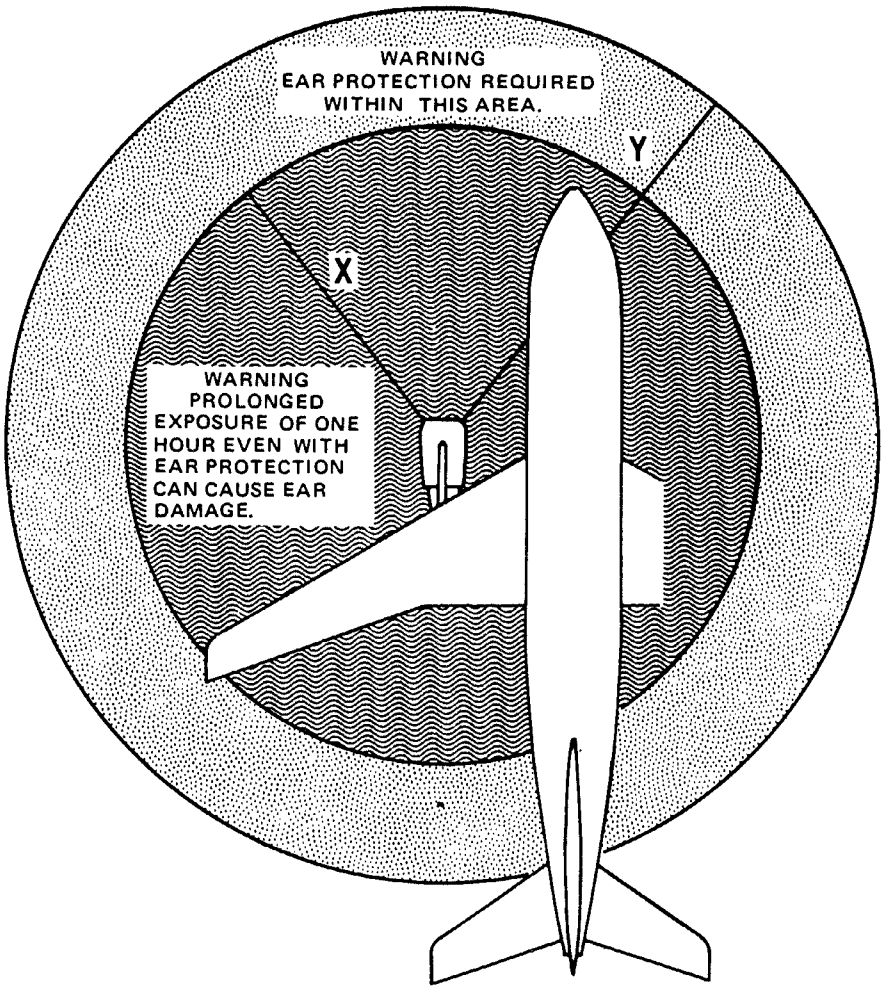
BM5 71 00 00 5 KPMO - 21

Jet Suction Area - Ground Idle
Figure 508



BM5 71 00 00 5 KRMO - 21

Jet Suction Area - Take-Off Thrust
Figure 509



POWER SETTING	RADIUS X	RADIUS Y
GROUND IDLE	75 FT. (23m)	100 FT (30m)
BREAK AWAY	90 FT (27m)	115 FT (35m)
TAKE–OFF	125 FT (38m)	200 FT (60m)

L–A1725

BM5 71 00 00 5 KTMO - 21

Engine Noise Danger Areas
Figure 510

4. General Test Information

A. The tests in this section apply to PW4000 series engines and provide minimum required testing after engine component repair or replacement to ensure an operable power plant.

B. The tests are numbered for positive identification. The following table lists test numbers and titles.

C. See Table 501 for Tests Numbers and Titles

Test Number	Title of Test
1	Pneumatic Leak Test
2	Dry Motoring - Wet Motoring
3	Ground Test - Idle Power
R 3A	Idle Leak Check
4	Power Acceleration/ Deceleration Test
5	Oil System Static Leak Test
6	Full Authority Digital Electronic Control (FADEC) Idle Test
7	Full Authority Digital Electronic Control (FADEC) Static Test
8	Vibration Survey
9	Performance Test
10	Engine Replacement Test (Pretested)
11	Engine Replacement Test (Untested)
12	Engine Vacuum Test
13	Main Oil Pressure Test
14	PT2 System Leak Check
15	FADEC Ground Test of the Engine Control System Actuators

Test Descriptions
Table 501

D. Test Reference Table
(1)This section will tell you which procedures are necessary after an engine, module or component is repaired or replaced. These tests are necessary to make sure that the engine operates satisfactorily after repair or replacement.
(2)The applicable tests that are necessary after the replacement of the engine (powerplant) or modules are listed in the Test Reference Table.
(3)If more than one test is listed (example : 2, 3, 4), all the tests are necessary and must be done in the sequence shown.
(4)The test for a complete engine (powerplant) replacement is for engines that were tested before in a test cell. It is also for engines that were removed for line maintenance tasks and not tested in a test cell. Line maintenance tasks are :

(a)The removal, installation or repair of engine externals (LRU's) with the engine removed.
(b)The replacement or repair of the LPC 1st stage (fan) blades with the engine removed.
(c)The replacement or repair of the fan (front) case with the engine removed.
(d)The replacement or repair of the main gearbox with the engine removed.

E. Any item not listed in test reference table does not require testing after replacement.

Component Repaired or Replaced BASIC ENGINE COMPONENTS	Test Required
LOW PRESSURE COMPRESSOR (LPC)	
Low Pressure Compressor (LPC)	9, 12 and 13
FAN CASES	
Fan Case Assembly	8 and 14
Fan Exit Case Assembly	8 and 14
Fan Blades	8
INTERMEDIATE CASE	
Intermediate Case	9, 12 and 13
HIGH PRESSURE COMPRESSOR (HP)	
High Pressure Compressor (HPC)	9
DIFFUSER AND COMBUSTOR	
Diffuser And Combustor	9, 12 and 13
TURBINE NOZZLE	
Turbine Nozzle	9
HIGH PRESSURE TURBINE (HPT)	
High Pressure Turbine (HPT)	9
LOW PRESSURE TURBINE	
Low Pressure Turbine (LPT)	9
TURBINE EXHAUST CASE	
Turbine Exhaust Case	8, 12 and 13

Component Repaired or Replaced BASIC ENGINE COMPONENTS	Test Required
MAIN GEARBOX	
Main Gearbox	3 or 3A, 12 and 13
Accessory Drive Seals	3 or 3A
Gearbox Strainer Elememt Assembly	2
Manual Crank Pad	3 or 3A or 5
ANGLE GEARBOX	
Angle Gearbox	3 or 3A, and 13
Angle Gearbox Lower Cover	2
ELECTRICAL POWER (24-00-00)	
Air/Oil Heat Exchanger (IDGS)	3 or 3A
FUEL AND CONTROL SYSTEM (73-00-00)	
Fuel Flow Transmitter	2 (Wet motoring) or
Fuel Flow Transmitter	3 or 3A
Fuel Pressure Transmitter	2 (Wet motoring) or
Fuel Flow Transmitter	3 or 3A
Fuel Pump	2 or 3 or 3A
Fuel Filter	2 or 3 or 3A
Fuel Distribution Valve	2 or 3 or 3A
Fuel Distribution Valve Filter	2 or 3 or 3A
Fuel Pump Filter Differential Pressure Switch	2 or 3 or 3A
Fuel Injector and Support	4
Full Authority Digital Electronic Engine Control (EEC)	7, 6
FADEC Pressure/Temperature (PT2/TT2) Probe	6 or 7, and 14
Fuel Metering Unit	3 or 3A
Fuel Metering Unit Filter	2 or 3 or 3A
FADEC Fuel/Oil Temperature Thermocouple Probe	3 or 3A
FADEC Wiring Harness	6
FADEC Permanent Maguet Alternator	6
FADEC Programming Plug	7
FADEC Thermocouple Probe (T3)	3 or 3A
Fuel Metering Unit Bypass Valve	2 or 3 or 3A
Fuel Manifolds And External Tubes	2 or 3 or 3A
Supplemental Control Unit	6
SCU Programming Plug	6
R IGNITION SYSTEM (74-00-00)	
R Ignition Exciter	Audible Check

	Component Repaired or Replaced	Test Required
	BASIC ENGINE COMPONENTS	
R	Exciter-To-Igniter Plug Cable	Audible Check
R	Igniter Plug	Audible Check
R		
R	AIR SYSTEM (75-00-00)	
R		
R	Turbine Case Cooling Air Valve (HPT)	3 or 3A, and 6
R	Turbine Vane/Turbine Blade Cooling Air Valve	3 or 3A, and 6
R	Turbine Case Cooling Air Valve Control Cable	6
R	Turbine Case Cooling Air Valve Actuator	6
R	Turbine Case Cooling Air Valve (LPT)	3 or 3A, and 6
R	Air/Oil Heat Exchanger Valve (Engine)	3 or 3A
R	Solenoid Air Filter	6
R	Air/Oil Heat Exchanger Valve (IDGS)	3 or 3A
R	No.3 Bearing Buffer Air Cooler	2 or 3 or 3A
R	Stator Vane Actuator (SVA)	3 or 3A, and 6, or 15
R	Inter Compressor (2.5) Bleed Actuator	3 or 3A, and 6, or 15
R	Ninth Stage Start Bleed Valve	6
R	Ninth Stage Start Bleed Valve Solenoid	6
R	External Air Tubes	2 or 3 or 3A
R	HPC Secondary Flow Control valve	6
R	HPC Secondary Flow Control Valve, Supplemental	
R	Air/Oil Heat Exchanger Valve Solenoid	6
R	HPC Secondary Flow Control Valve/Turbine Vane	
R	Cooling Air Valve Solenoid	6
R	Turbine Vane/Turbine Blade Cooling Air Valve	
R	Solenoid	6

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

R	Turbine Vane and Blade Cooling Air Valve, IDGS	
R	Air/Oil Heat Exchanger Valve Override	
R	Solenoid	6
R	Turbine Vane Cooling Air Valve, Turbine Vane	
R	and Blade Cooling Air Valve Solenoid	6

**ON A/C 101-200,

	INDICATING SYSTEM (77-00-00)	
	EGT (TT4.95) T/C Box And Cable	3 or 3A
	EGT (TT4.95) T/C Probes	3 or 3A
	OIL SYSTEM (79-00-00)	
	Chip Collector - Magnetic	3 or 3A

	Component Repaired or Replaced	Test Required
	BASIC ENGINE COMPONENTS	
	Lubrication and Scavenge Oil Pumps	3 or 3A, and 13
	Fuel/Oil Heat Exchanger (Engine & IDGS)	3 or 3A
	Fuel/Oil Heat Exchanger Bypass Valve	3 or 3A
	Air/Oil Heat Exchanger (Engine)	3 or 3A
	Air/Oil Heat Exchanger Valve	3 or 3A
	Oil Tank	3 or 3A
	Oil Filter	3 or 3A
	Oil Filter Differential Pressure Switch	3 or 3A
	Oil Filter Pressure Relief Valve	3 or 3A
	External Oil Tubes	3 or 3A
R	Oil Pressure Transmitter	3 or 3A
	DIAGNOSTIC COMPONENTS (OPTIONAL)	
	FADEC Speed Transducer (N1)/Multiplexer Input Probe	6
	ENGINE CHANGE	
	Engine pretested	10 and 7
	Engine untested	11, 7 and 4
	ELECTRICAL HARNESS	
	Electrical Harness	6

5. Engine Tests

A. Precautionary Procedures And Limitations

(1)Compressor Surge

CAUTION : NEVER ADVANCE, OR FAIL TO RETARD, THROTTLE CONTROL LEVER ON AN ENGINE THAT IS SURGING. ENGINE DESTRUCTION CAN RESULT. DO NOT FAIL TO FOLLOW DESCRIBED START PROCEDURE FOLLOWING EMERGENCY ENGINE SHUTDOWN. DAMAGE TO TURBINE BLADE TIP SEALS COULD RESULT.

(a)If compressor surge is encountered, rapidly (in less than one second) retard throttle control lever to idle, move HP Fuel Shutoff valve control lever to OFF position, and motor engine until TT4.95 (EGT) has been driven below 356°F (180°C). Refer to paragraph for Start Procedure Following Emergency Shutdown. (Ref. 71-00-00, P. Block 201).

NOTE : Non recoverable surge can be recognized by a rapidly increasing EGT, sudden loss of rotor speeds and an hability of engine to respond to throttle movement. Surge at idle or low thrust may possibly by characterized by an abnormally high stabilized EGT and lack of throttle response. Engine can be restored to normal operation only by shutdown and restart.

(2)Engine Overtemperature

(a)When TT4.95 (EGT) limits are exceeded, under conditions other than surge, engine should not be shut down on an emergency basis, but should be cooled five minutes at idle unless it is obvious that continued

operation will result in additional engine damage. Regardless of how engine is shut down, it should not be restarted until inspection shows that both engine rotors will rotate normally and appropriate overtemperature inspection requirements have been accomplished per applicable paragraph on Specifications And Operating Limits. (Ref. 71-00-00, P. Block 201).

(b) If overtemperature is encountered as a result of surge, engine must be shut down as described in step (1) above.

(3) Unless otherwise specified, all performance tests must be performed without any load applied and without any bleed air usage.

(4) Ignition Ground Use Limits

(a) After engine is started, ignition should remain off during all maintenance ground running, to minimize possibility of overtemperature in event of compressor surge.

(5) Airframe Thrust Reverser

(a) Precaution, must be taken to assure that reverser system remains deactivated at all times, including when throttle control lever is in reverse.

(6) Throttle Control Lever Movement

NOTE : Performance deterioration can result from increased gaspath seal clearance caused by wear associated with high thermal gradients which occur during rapid throttle control changes. To minimize turbine seal wear, all throttle control lever movements should follow the instructions given below.

(a) Idle at least 5 minutes after initial engine start-up and before normal engine shutdown.

(b) If the engine is run to high power (above 1.4 EPR) for more than 30 seconds, including the acceleration time, and then returned to idle, the stabilization time at idle should either be less than one minute or greater than 10 minutes before snap re-acceleration to high power. This recommendation can be waived, if the re-acceleration is performed slowly (a minimum of 60 seconds).

B. Engine Test Data Designations

(1) For ease of use, symbols have been designated for various measured parameters at stations internal and external to the engine. These parameters are listed below.

AMB	Ambient Temperature (T) or Pressure (P)
TT2	Compressor Inlet Total Temperature
PT2	Compressor Inlet Total Pressure
PS2	Compressor Inlet Static Pressure
PT2.5	Low Pressure Compressor discharge Total Pressure
PS3	Burner Case Static Pressure
PS4I	Turbine Cooling Air Static Pressure
TT4.9	Turbine Discharge Total Temperature
PT4.9	Turbine Discharge Total Pressure
EPR	Engine Pressure Ratio
TCLR	Throttle Control Lever Resolver
WF	Fuel Flow
N1	Low Pressure Compressor Rotor Angular Speed
N2	High Pressure Compressor Rotor Angular Speed

EGT	Exhaust Gas Temperature
OAT	Outside Air Temperature
BVA	Bleed Valve Position
SVA	Stator Vane Angle

C. Specifications and Operating Limits
(1)(Ref. 71-00-00, P. Block 201)
(2)Typical operating ranges
(a)The following data may be used as a guideline for expected performance levels. These ranges are not limits and are to be used only as a general guide.

EPR	N1 RANGE % RPM	N2 RANGE % RPM	TT4.95 (EGT) RANGE DEGREES C
1.02	25 - 33	64 - 70	290 - 350
1.04	30 - 38	66 - 72	300 - 360
1.06	35 - 43	68 - 74	305 - 365
1.08	40 - 48	70 - 76	315 - 375
1.10	45 - 53	72 - 78	325 - 385
1.12	49 - 57	74 - 80	335 - 395
1.14	54 - 62	76 - 82	345 - 405
1.16	57 - 65	78 - 84	350 - 410
1.18	61 - 69	80 - 86	360 - 420
1.20	64 - 72	81 - 87	370 - 430
1.22	68 - 76	83 - 89	375 - 435
1.24	71 - 79	84 - 90	385 - 445
1.26	73 - 81	85 - 91	395 - 455
1.28	76 - 84	87 - 93	400 - 460
1.30	78 - 86	88 - 94	410 - 470
1.32	80 - 88	89 - 95	415 - 475
1.34	82 - 90	90 - 96	425 - 485
1.36	84 - 92	91 - 97	430 - 490
1.38	85 - 93	91 - 97	440 - 500
1.40	86 - 94	92 - 98	445 - 505

D. Wind Direction
(1)Tailwinds, or winds with tailwind components, adversly affect ground operation of the engines. During starting, and at idle or low power settings, excessive EGT can result. At high power settings, a compressor surge might occur in gusty crosswinds, or tailwind conditions. A compressor surge is identified by a sudden loud increase in air noise as separation occurs over the nose cowl lip and is indicated by a sudden instability in the EPR gage. Throttle control lever retardations, from high power settings to "IDLE", must be made rapidly (1 - 2 seconds) to clear surge, monitor EGT. EGT and fuel flow should decrease. Preferred relative wind data for engine maintenance runs are shown in (Ref. Fig. 501).

E. Trim Balance
(1)General
(a)This trim balance procedure provides two methods of reducing the low rotor vibration levels in the engine.
(b)PBS-4100 Dual Pick-Up : This method uses the PBS-4100 Trim balancing system that collects engine vibration data from two engine installed vibration pick-ups ; one on "A" flange and one on "P" flange. The PBS-4100 also calculates the balance solution. This is the preferred method because it will produce the lowest engine vibration levels. This method must be used when a reduction in cabin noise is necessary.
(c)PBS-4100/EVM : This method utilizes the aircraft EVM system and the PBS-4100 Balancing System. The PBS-4100 is plugged into the EVM Signal Conditioner. The PBS-4100 collects the vibration data and calculates the balance solution. This method is used to lower the EVM "A" flange pick-up vibration levels only. This method limits the quantity of weight that can be installed to the fan balance flange.
Turbine plane balancing cannot be done using this method.

F. PBS-4100 Dual Pick-Up Trim Balance
(1)General
(a)It is recommended that this trim balance procedure be performed by personnel that are trained in the use and operation of the PBS-4100 portable trim balancing system and have experience with engine trim balance.
(b)This trim balance procedure incorporates the use of the PBS-4100 portable balancing system. The PBS-4100 data acquisition unit collects speed and vibration pick-up data from the engine installed equipment. It then converts that data into digital data suitable for computer analysis which is transmitted to the PBS computer. The computer then performs the calculations necessary to give the trim balance solutions, vibration surveys, frequency spectra and oscilloscope displays.
The PBS-4100 operation and maintenance manual should be used for normal operation and setup instructions.
(c)A fan plane balance will affect the low rotor vibration levels on both the vibration pick-ups ("A" and "P" Flanges). Also, fan plane trim balance counterweights are easier to install. Therefore, it is advisable to attempt a fan plane balance first.
(d)This procedure describes the following :
1 Installation of engine equipment and external cables.
2 Listing of available fan and turbine plane counterweights.
3 Instructions for the installation of the counterweights.
4 Engine test requirements.
5 Supplemental PBS-4100 operation and setup information.
(2)Equipment and Materials

ITEM	DESIGNATION
A.	Packing
B.	Counterweights
C.	Rivet
D.	Cotter pin
E.	Key Washer

ITEM	DESIGNATION
F.	Analyser, Vibration
G.	Jackscrews 0.190-32
H.	Amplifier, Isolation, 100 Kohms (may not be required - dependent on Analyzer Model/Type used)
J.	"A" Flange Vibration Pick-up Bracket (PN 2825-4045)
K.	"P" Flange Vibration Pick-up Bracket (PN 2825-4044)
L.	Vibration Pick-up (Accelerometer) ; 2 required (PN 5500-4001)
M.	"A" Flange Vibration Pick-up Cable (PN 8218-5201)
N.	"P" Flange Vibration Pick-up Cable (PN 8218-5202)
P.	N1 Breakout Cable (PN 8218-5203)
Q.	Engine Jumper Charge Amplifier (PN 8900-5036)
R.	Charge Amplifier (PN 8000-4225)
S.	Engine Interface Cable (PN 8900-5034)
T.	PBS Jumper (PN 8900-5035)
U.	PBS-4100 Portable Balancing System (Data Acquisition Unit And Computer) (PN 7000-4133)
V. PWA76855	Pump, Hydraulic (Use with PWA86302)
W. PWA85234	Riveter (For LPC counterweights)
X. PWA85306	Puller (For turbine shaft plug)
Y. PWA86302	Bender, Hydraulic (Optional to PWA102335)
R AA.PWA102335	Bender, Mechanical (Optional to PWA86302)
R AB.Material No.P03-001	Oils (Ref. 70-00-00)
R AC.Material No.P05-018	Special Materials (Ref. 70-00-00)
R AD.Material No.P05-026	Special Materials (Ref. 70-00-00)
R AE.Material No.P06-002	Lubricants (Ref. 70-00-00)

Referenced Procedures

- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-00-00, P. Block 201	Power Plant - General
- 71-00-00, P. Block 401	Power Plant - General
- 72-21-01, P. Block 401	Inlet Cone

(3)General

NOTE : If vibration occurred after fan blade replacement, the replaced blades should be inspected to make sure that the moment weight pairs do not exceed 1.0 oz-in (720 g.mm) difference.
The moment weight is marked on the concave airfoil surface inboard of the mid-span shroud. If necessary, replace with a different set of moment weight fan blade pair.

CAUTION : TRIM BALANCE SHOULD NOT BE USED TO CORRECT VIBRATION CAUSED BY MECHANICAL PROBLEMS.

EXAMPLES OF THIS TYPE OF PROBLEM ARE :

INCORRECT ASSEMBLY - INCORRECT ASSEMBLY DURING ENGINE OVERHAUL OR REPAIR CAN BE SHOWN BY VIBRATION LEVELS LARGER THAN TWICE THE VIBRATION LIMIT. SEE VIBRATION LIMITS (REF. 71-00-00, P. BLOCK 201).

DAMAGE TO ROTOR PARTS - PART DAMAGE MUST BE REPAIRED BEFORE ENGINE TRIM BALANCE.

(a) Trim balance can decrease engine vibration. The trim balance procedure adds a small amount of weight to correct unbalance. The weight(s) are installed on the compressor front balance plane and the turbine rear balance plane. The trim balance procedure can be done on the engine while it is on the airplane.

(b) Trim balance is only used to correct stable low rotor related (1EL) vibration.

(c) The total vector sum of the trim balance weights and the weights installed for component (LPC) balance must not be more than the limits that follow :
Fan plane : 50 oz-in. (36,000 g.mm)
LPT : 48 oz-in. (34,560 g.mm)
Engines that require more correction weight than allowed should be inspected for incorrect assembly and/or part damage.

(d) Identify all the trim balance weights permanently with the letters "TB".
NOTE : The balance weights installed on the fan hub during LPC balance are not identified with the letters "TB".

(e) If the sum of the low rotor and the high rotor vibration does not equal the total vibration, then some N1 or N2 related vibration harmonics or noise caused by the equipment (leads and pick-ups) can be present. The total vibration limit applies to the square root of the sum of the N1 vibration squared plus the N2 vibration squared.

(f) The first trial balance weights are identified as CW1, the second weights CW2, the third weights as CW3, etc.

(g) Definitions :
1 1EL : The low rotor related vibration.
2 Vibration Units : Measure vibration displacement in mils (mm) or vibration velocity in inches per second (mm per second).
1 mil = 0.001 Inch (0.025 mm)
3 Phase Angle Lag : The angle the low rotor turns during the time the "heavy point" goes by the vibration transducer and the effect of this is shown.
4 Phase Angle : The angle between the signal from the vibration transducer and the signal from the once per revolution N1 speed reference.
NOTE : This procedure uses phase measurement equipment that measures from the N1 speed pulse to the vibration pulse (maximum).
Measure positive angles, in this coordinate system, in the opposite direction from the direction in which the engine turns (lag angle). Some phase measurement equipment, such as

MTI PBS-4000 equipment, measure positive angles in the direction in which the engine turns (lead angle). The PBS-4100 can be set to either lead or lag angle.

5 Sensitivity : The moment weight that causes 1.0 mil (0.025 mm) of vibration.

6 Once Per Revolution N1 Speed Reference : The short tooth of the tachometer gear on the turbine shaft coupling makes a signal to the N1 speed transducer once each revolution. As an alternative method, use an optical tachometer for the once per revolution N1 speed reference.

7 N1 Reference Blade : Fan blade ink marked for reference to short tooth location.

8 Stable Vibration : Stable vibration is a vibration of which the maximum does not change by more than one quarter of the average (vibration) during 30 seconds of engine operation.

9 Vibration Survey : The process to get and record the engine vibration data versus rotational speed during an engine acceleration /deceleration. This is used to document that an engine is within the vibration limits. It is also used to identify peak vibration levels at certain engine speeds which are not within the vibration limits.

10 Trim Balance Survey : This survey is done after or during the Vibration Survey. The engine is tested at predetermined N1 speeds. The (1EL) low rotor engine vibration amplitude and phase angle data are recorded at each of the predetermined N1 speeds.

(4)Procedure

(a)Install the accelerometers (vibration transducers). (Ref. Fig. 511)

NOTE : Install accelerometer leads along tubes and harnesses, and attach every 12 - 16 inches (305. - 406. mm). Do not install on fire detection loops or tubes which contain hot bleed air. Install accelerometer leads so that they will not touch the closed nacelle doors.

1 Install a bracket and an accelerometer and lead assembly to the bracket on Flange A. (Ref. Fig. 511) (Sheet 1).

2 Install a bracket and an accelerometer and lead assembly on Flange P. Install the bracket at the 1:30 o'clock position. (Ref. Fig. 511) (Sheet 2). The pick-up bracket can be installed on the forward or rearward side of "P" Flange.

(b)Install the trim balance equipment. (Ref. Fig. 512)

1 Install a MTI PN 8218-5203 N1 breakout cable to the N1 probe connector.

2 Close the left hand reverser door. Install the N1 breakout cable (PN 8218-5203) as necessary so the connector will exit the reverser doors at the overboard drain access door.

3 Install the "P" Flange vibration pick-up cable (PN 8218-5202) as necessary so the connector will exit the reverser doors at the overboard drain access door.

4 Close the right hand reverser door. Before closing the overboard drain access door put the cable connectors through the louvers in the door.

NOTE : When closing the doors make sure that the cables do not

get pinched by the bumper stops.

5 Use tie-raps to attach the charge amplifier (PN 8900-5036) to the overboard drain access door.
This can be done by routing the tie-raps through the handle of the amplifier and the louvers in the access door.

6 Close fan cowling. When closing the fan cowling, put the "A" flange vibration pick-up cable (PN 8218-5201) between the cowling at 6:00 o'clock position. Be careful not to damage the lead. A slight pinching of the cable is permitted.

7 Connect the "A" Flange vibration pick-up cable (PN 8218-5201) to the Channel 1 connector on the charge amplifier (PN 8000-4225).

8 Connect the "P" Flange vibration pick-up cable (PN 8218-5202) to the Channel 2 connector on the charge amplifier (PN 8000-4225).

9 Connect the N1 breakout cable to the engine jumper cable (PN 8900-5036).

10 Connect the engine jumper cable (PN 8900-5036) to the charge amplifier (PN 8000-4225).

11 Connect the engine interface cable (PN 8900-5034) to the engine jumper cable (PN 8900-5036).

12 Install the engine interface cable (PN 8900-5034) along the aircraft as necessary and through any access door into the cabin. Speed tape can be used to attach the cable to the aircraft.

13 Connect the engine interface cable (PN 8900-5034) to the PBS jumper (PN 8900-5035).

14 Connect the PBS jumper (PN 8900-5035) to the PBS-4100 (PN 7000-4133).
NOTE : Refer to the PBS-4100 equipment manual for installations instructions of the PBS-4100 (PN 7000-4133).

(c)Find the mark (recess) that refers to the once per revolution N1 speed signals as follows :

1 Use a Silver Pencil (Material No.P05-018) and mark the inlet cone front segment and the inlet cone (rear) segment for alignment during installation.

2 Remove the compressor inlet cone front segment (Ref. 72-21-01, P. Block 401).

3 Remove the key washer retaining ring and the retaining nut key washer which holds the turbine shaft plug, at the front of the coupling. Use a PWA85306 Puller to remove the plug. Discard the packing. (Ref. Fig. 513)

4 Find the small recess on the end of the turbine shaft coupling assembly. This recess shows the location of the short tooth which makes the signal for the N1 speed transducer. Mark the fan blade which is aligned with this recess, using Ink (Material No.P05-026), in easily seen location.

5 Install a new packing lubricated with Petrolatum White (Material No.P06-002), to the turbine shaft plug.
Install the plug to the coupling ID and install the key washer and the retaining ring.
NOTE : Make sure retaining ring is fully inserted in the retaining nut groove, all around, and ring end gap is 0.01 in. (0.254 mm).

6 Make a mark on the fan blade rubstrip, with Silver Pencil

(Material No.P05-018), at the 12:00 o'clock position.
NOTE : The fan is considered "indexed" when the mark on the fan blade is aligned with the mark on fan blade rubstrip.

7 Examine the hub flange for installed counterweights. Check each counterweight for the letters "TB" marked on the inner diameter face. Record part number and tang location of all counterweights marked "TB".
NOTE : After the fan is indexed, the tang at the 12:00 o'clock position is the No. 1 tang. The tangs are numbered 1 through 19 in the clockwise direction.

8 If weights marked "TB" are installed, use the "Trial Weight Balancing" option on the computer.

9 If weights marked "TB" are not installed, use the "Stored Influence Coefficient Balancing" option on the computer.

10 Install the compressor inlet cone. (Ref. 72-21-01, P. Block 401).

(d)Do the vibration/trim balance survey as follows :
NOTE : You must have a thermally stable engine before you do the vibration/trim balance survey.

R 1 Obey the safety and operating precautions as described in
R Paragraph 2. (Ref. 71-00-00, P. Block 501).
R 2 Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.
R 3 There must be two qualified persons in the cockpit when
R performing an engine run above idle. One must monitor the outside
R and the aircraft behaviour while the other performs the engine test.
R 4 If the aircraft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.
R 5 Start the engine and operate at IDLE power. (Ref. 71-00-00, P. Block 201).
R 6 Do a slow acceleration to 1.3 EPR power and stay at this power for three minutes.
R 7 Decrease the power to IDLE and operate at this power for six minutes.
NOTE : You now have a thermally stable engine.
R 8 Perform a vibration survey by Engine Test No. 8 which is a slow accel (90 - 120 seconds) to 90% N1 (3250 RPM). During the vibration survey perform the trim balance survey by stopping at the following N1 speeds and take trim balance data.

63% N1 (2250 RPM) speed
68% N1 (2450 RPM) speed
82% N1 (2950 RPM) speed
90% N1 (3250 RPM) speed

NOTE : Refer to PBS-4100 operation manual for instruction on computer operation.
NOTE : PBS-4100 software V2.21 and higher will let you to take the trim balance data during the vibration survey. If the software is pre V2.21, the vibration survey and the trim balance can be performed separately.

R 9 After the accel vibration survey perform a decel vibration

survey per Engine Test No. 8 which is a slow decel (90 - 120 seconds) to idle.

NOTE : Trim balance data is only taken during the accel vibration survey.

R 10 Stabilize at idle for 5 minutes and then do an engine shutdown (Ref. 71-00-00, P. Block 201).

(e)Procedures necessary after the first vibration/trim balance survey.

1 Remove the compressor inlet cone front segment (Ref. 72-21-01, P. Block 401).

2 Index the fan by aligning the marked fan blade with the mark on the fan rubstrip at the twelve o'clock position.

NOTE : After the fan is indexed, the tang at the 12:00 o'clock position is the No. 1 tang. The tangs are numbered 1 through 19 in the clockwise direction.

3 Examine the hub flange for installed counterweights. Check each counterweight for the letters "TB" marked on the inner diameter face. Record part number and tang location of all counterweights marked "TB". Remove all the counterweights marked "TB".

4 If weights marked "TB" were removed, input their weights (PBS class number) and location (tang number) into the PBS-4100 computer. The PBS class number must be input as a negative (-) number.

5 If "TB" weights were removed go to the next step 6. If counterweights marked "TB" are not present, install counterweights No. 1 (CW1) trial weights to the fan balance ring as directed by the PBS-4100 computer.

NOTE : Use "Stored Influence Coefficient Balancing" option to determine CW1 weight location. Be sure to select the coefficient file that is for the location of the "P" flange (1:30 o'clock position).

Fan counterweights can be temporarily installed by using a cotter pin (MS9245-45).

6 Install the compressor inlet cone (Ref. 72-21-01, P. BLock 401).

7 Perform vibration/trim balance survey. See step (d).

(f)If the vibration levels are satisfactory, remove the trim balance equipment by Step (j).

(g)If the vibration levels are not satisfactory do the steps that follow :

1 Using the "PREDICT" feature of the PBS-4100 determine if the PBS-4100 fan plane balance solution will reduce the vibration to satisfactory levels.

2 If changing the amount and location of the fan plane counterweights will reduce "A" flange and "B" flange vibration to satisfactory levels, use a cotter pin (MS9245-45) and install the counterweight(s) to the fan balance hub as directed by the PBS-4100 computer. See Table 501. Repeat vibration/trim balance survey, step (d). If the vibration levels are reduced to satisfactory levels permanently install the fan counterweights. See step (h).

NOTE : Using a cotter pin to secure a counterweight is a temporary installation.

CLASS	COUNTERWEIGHT WITH COTTER PIN (MS9245-45)
	Counterweight (534493)
1	2.0 oz-in (1440 g.mm)
2	2.4 oz-in (1728 g.mm)
3	2.8 oz-in (2016 g.mm)
	Counterweight (534495)
1	4.9 oz-in (3528 g.mm)
2	5.3 oz-in (3816 g.mm)
3	5.7 oz-in (4104 g.mm)
4	6.1 oz-in (4392 g.mm)
5	6.5 oz-in (4680 g.mm)
	Counterweight (1B4294)
	12.8 oz-in (9216 g.mm)

Fan Plane Trim Balance Counterweights
Table 501

3 If changing the amount and location of the fan plane counterweights will not reduce the "A" flange vibration to satisfactory levels, remove the engine. If changing the amount and location of the fan plane counterweights will not reduce the "P" flange vibration to satisfactory levels, remove the fan counterweights and install counterweights to the low turbine as directed by the PBS-4100. Repeat vibration/trim balance survey, step (d). If the vibration levels are reduced to satisfactory levels, remove trim balance equipment per step (j).

NOTE : Low turbine plane counterweights are installed to the 6th stage turbine blades per step (k). See Table 502. There are 128 6th stage turbine blades. With the fan indexed the No. 1 turbine will be the blade at 12:00 o'clock. The blades are Numbered 1 through 128 in the clockwise direction.

COUNTERWEIGHT
Counterweight (5ON401)
4.3 oz-in (3096 g.mm)

LPT Plane Trim Balance Weights
Table 502

4 If "P" Flange vibration pick-up levels are not satisfactory, but changing the amount and location of the turbine plane counterweights will reduce the vibration to satisfactory levels, remove and reinstall the counterweight(s) as directed by the PBS-4100 computer. Repeat

vibration/trim balance survey, step (d). If the vibration levels are reduced to satisfactory levels remove trim balance equipment per step (j).

5 If "A flange vibration pick-up levels are not satisfactory after the turbine plane balance is completed and "P" flange vibration pick-up are satisfactory, install fan counterweights. The PBS-4100 will determine counterweight and location. Repeat vibration/trim balance survey step (d). If the vibration levels are reduced to satisfactory levels permanently, install the fan counterweights. See step (h).

NOTE : Installing both fan and turbine plane counterweights to trim balance the engine is called a two plane balance.

(h)Install the permanent fan plane counterweight(s).

1 Record the location and the moment weight of all the trial balance weights.

NOTE : Vibro peen the letters "TB" on the inner diameter face of all the trim balance counterweights.

2 Install the counterweight(s) with a rivet. See Table 501. Use a PWA85234 Riveter to make a 0.125 inch (3.175 mm) diameter head on the rivet. (Ref. Fig. 514).

3 Align the pencil mark on the inlet cone front segment with the pencil mark on the inlet cone (rear) segment. Install the cone front segment with six washers and bolts, lubricated with Engine Oil (Material No.P03-001). Tighten and TORQUE bolts to between 45 and 50 lbf.in. (0.51 and 0.56 m.daN).

4 Operate the engine with the counterweights installed. (Ref. Engine Test No. 8). Make sure that the engine vibration is within limits.

(j)Remove the test equipment from the engine.

1 Remove the "A" and "P" flange accelerometers and vibration pick-up brackets.

2 Remove all the vibration pick-up cables, engine interface cable, N1 breakout cable, and jumper cable.

3 Remove and discard all cable tie-wraps and cable attachment tape.

4 Install two bolts and nuts, lubricated with Engine Oil (Material No.P03-001) to Flange P at the accelerometer bracket location. TORQUE the nuts to between 180 and 200 lbf.in. (2.04 and 2.25 m.daN).

NOTE : Install the bolts with the heads toward the front of the engine.

(k)Install counterweights to the LPT 6th stage turbine blade. Install a clip-on counterweight (5ON401) to the 6th stage turbine blade shroud. A maximum of 10 LPT clip-on weights can be installed on an engine. See Table 502. (Ref. Fig. 515) (Sheet 1/4).

(l)There are two methods for installing the LPT clip-on counterweight :

1 Attach the counterweights with a PWA86302 Hydraulic Bender and a PWA76855 Hydraulic Pump. (Ref. Fig. 515) (Sheet 2/4).

2 Attach the counterweights with a PWA102335 Mechanical Bender as follows. (Ref. Fig. 515) (Sheets 3/4 and 4/4).

a Put the counterweight on the counterweight holder of the PWA102335 Mechanical Bender.

CAUTION : DO NOT BEND THE COUNTERWEIGHT TABS WHEN YOU HOLD THE COUNTERWEIGHT IN THE MECHANICAL BENDER. IF YOU BEND THE

TABS, YOU WILL NOT BE ABLE TO INSTALL THE COUNTERWEIGHT ON THE 6TH STAGE TURBINE BLADE.

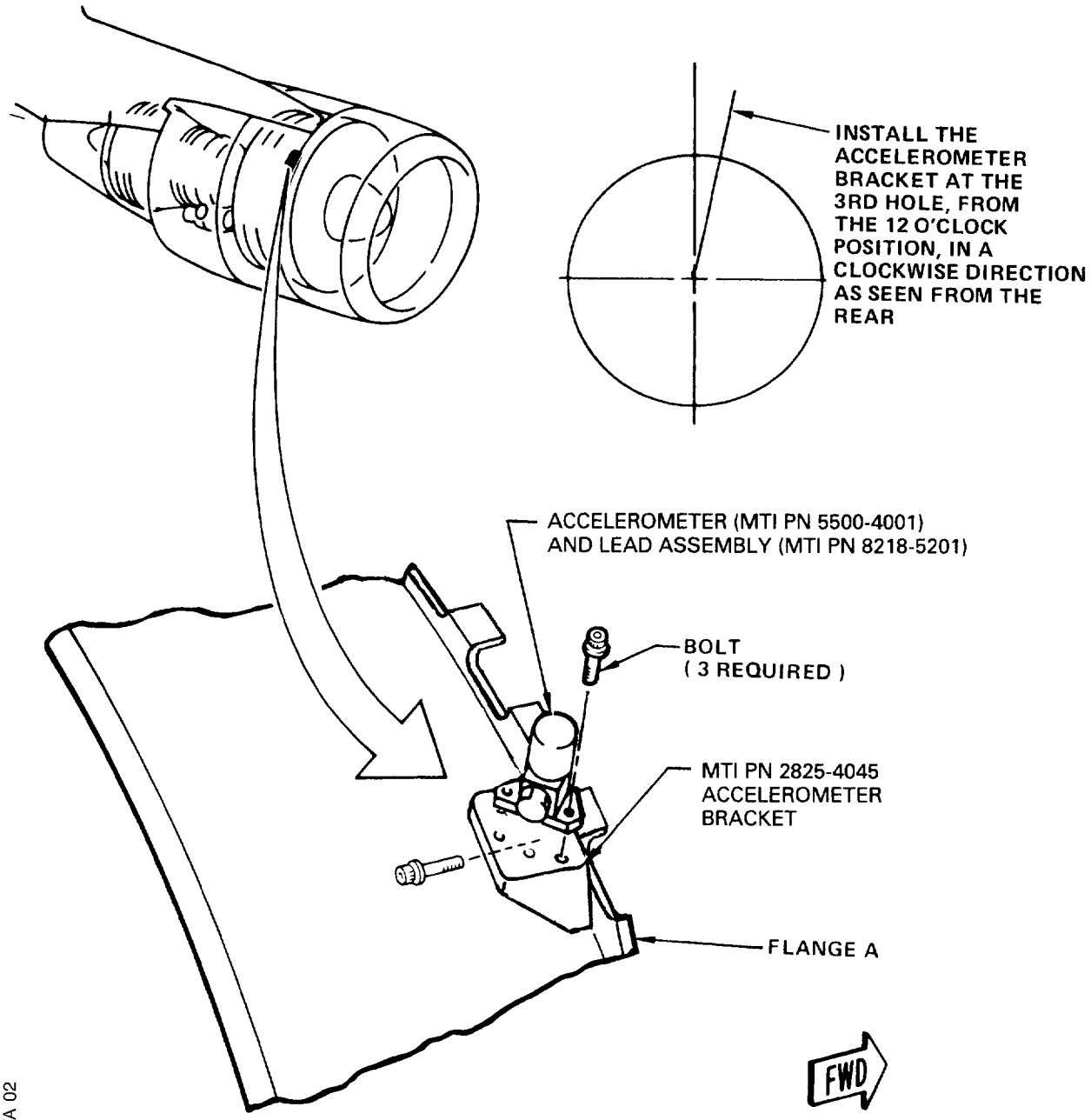
b Operate the quick grip handle to lightly hold the counterweight. Do not squeeze the quick grip handle too much so that you bend the counterweight tabs.

c Put the PWA102335 Mechanical Bender with the counterweight on the airfoil section of the designated 6th stage turbine blade(s).

d With the counterweight still installed in the bender, slide the counterweight along the airfoil onto the blade outer shroud. Make sure the counterweight hook goes around the leading edge of the blade.

e To attach the counterweight to the blade, operate the quick grip handle to bend the tab. Operate the quick grip handle until it hits the bar stop.

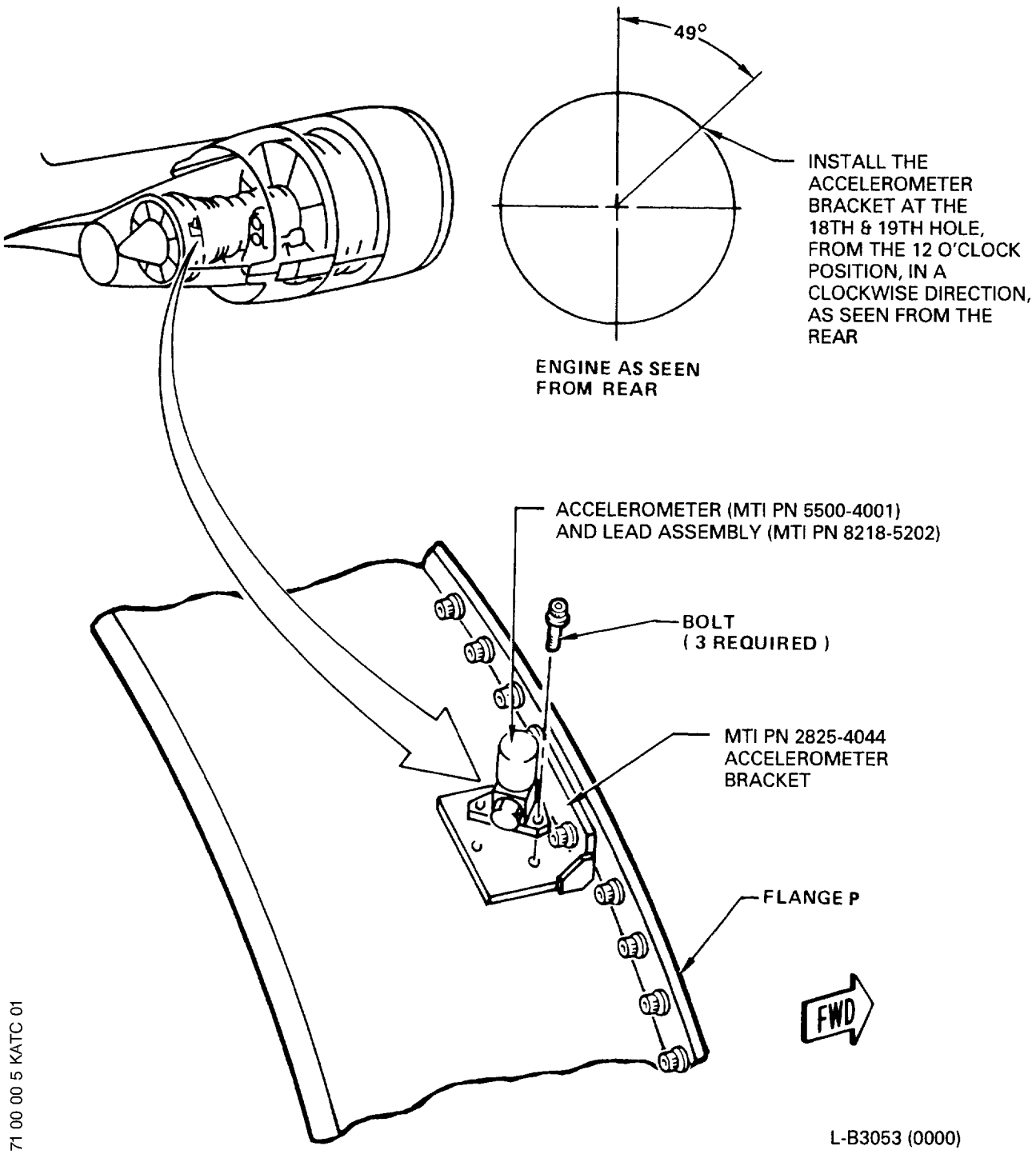
f Release the quick grip handle and remove the PWA102335 Mechanical Bender from the engine.


INSTALL THE ACCELEROMETER BRACKET AT THE 3RD HOLE, FROM THE 12 O'CLOCK POSITION, IN A CLOCKWISE DIRECTION AS SEEN FROM THE REAR
ACCELEROMETER (MTI PN 5500-4001) AND LEAD ASSEMBLY (MTI PN 8218-5201)
BOLT (3 REQUIRED)
MTI PN 2825-4045 ACCELEROMETER BRACKET
FLANGE A
FWD

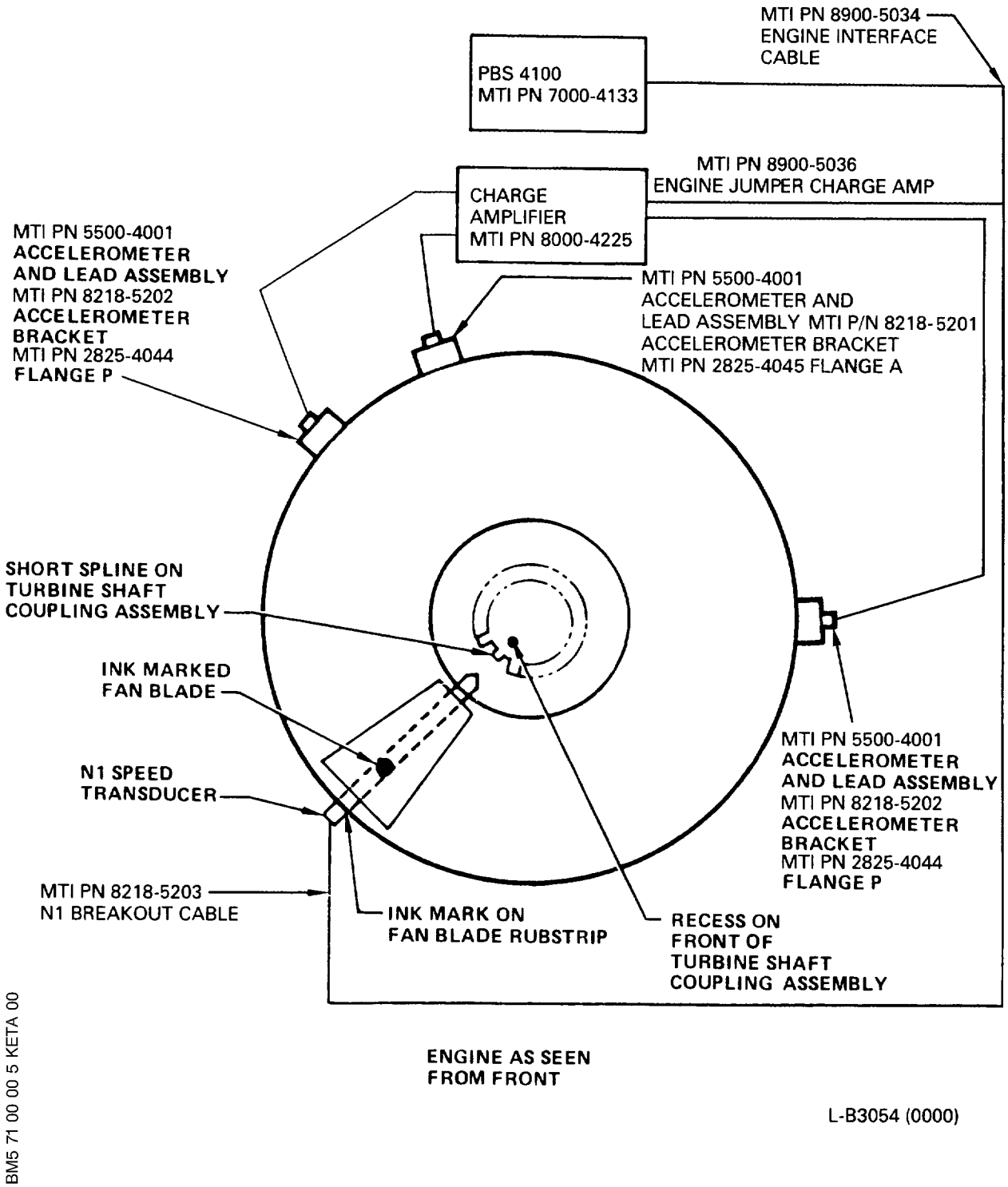
L-A9013 (0000)

BM5 71 00 00 5 KATA 02

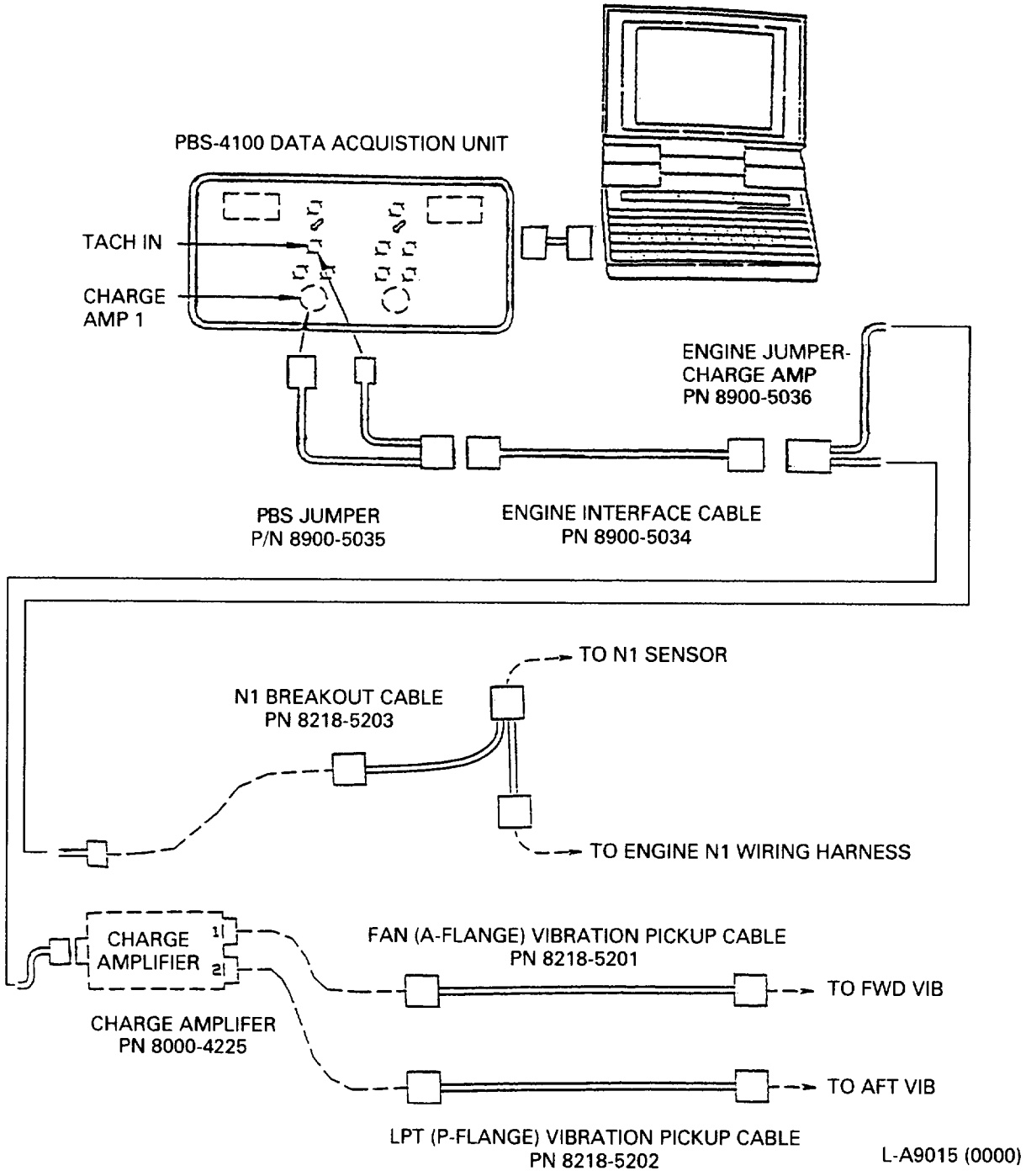
Accelerometer Installation on Flange A (Sheet 1)
Figure 511


49°
INSTALL THE ACCELEROMETER BRACKET AT THE 18TH & 19TH HOLE, FROM THE 12 O'CLOCK POSITION, IN A CLOCKWISE DIRECTION, AS SEEN FROM THE REAR
ENGINE AS SEEN FROM REAR
ACCELEROMETER (MTI PN 5500-4001) AND LEAD ASSEMBLY (MTI PN 8218-5202)
BOLT (3 REQUIRED)
MTI PN 2825-4044 ACCELEROMETER BRACKET
FLANGE P
FWD
L-B3053 (0000)
BM5 71 00 00 5 KATC 01

Accelerometer Installation on Flange P (Sheet 2)
Figure 511

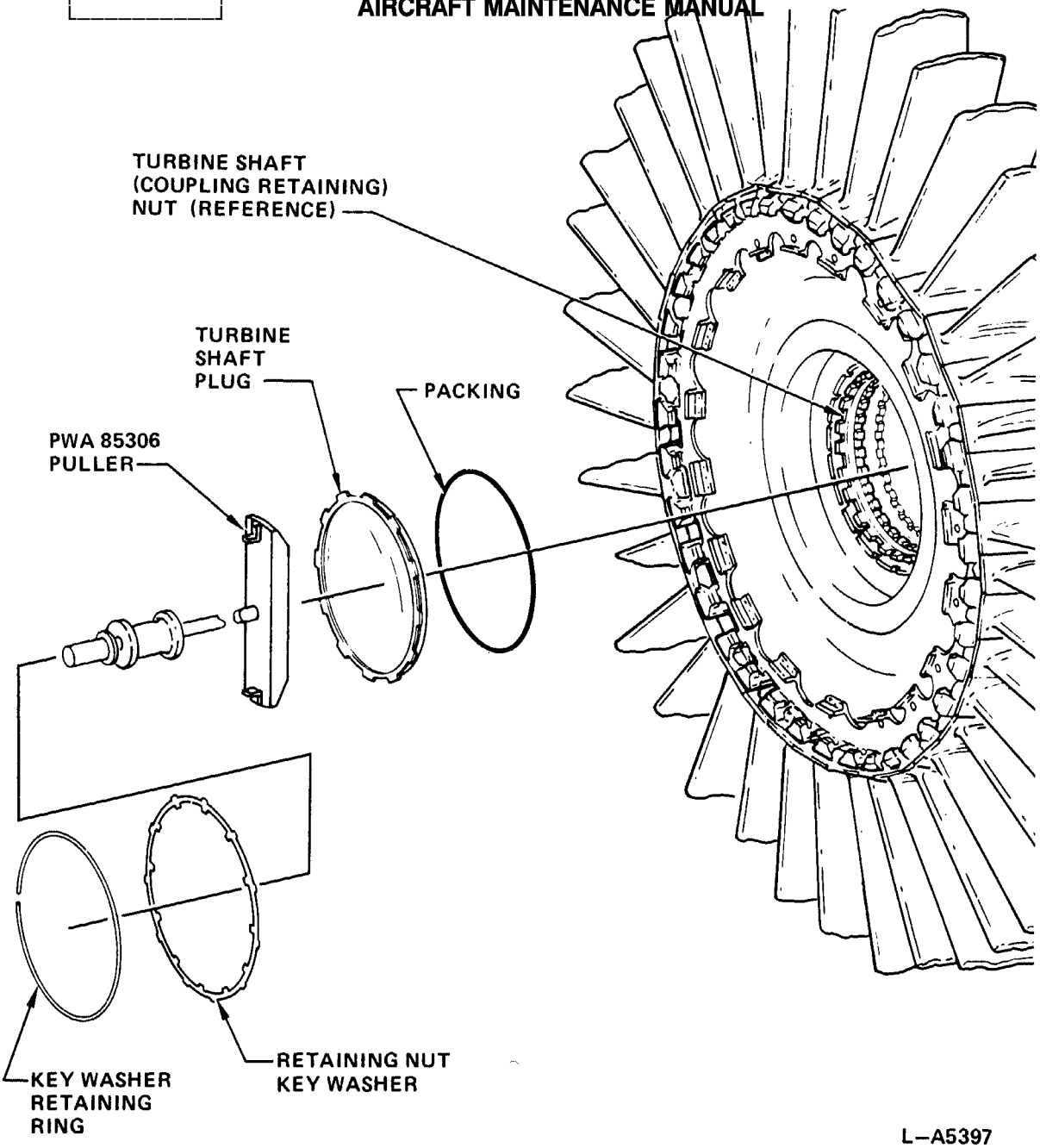


Trim Balance Equipment (Sheet 1)
Figure 512



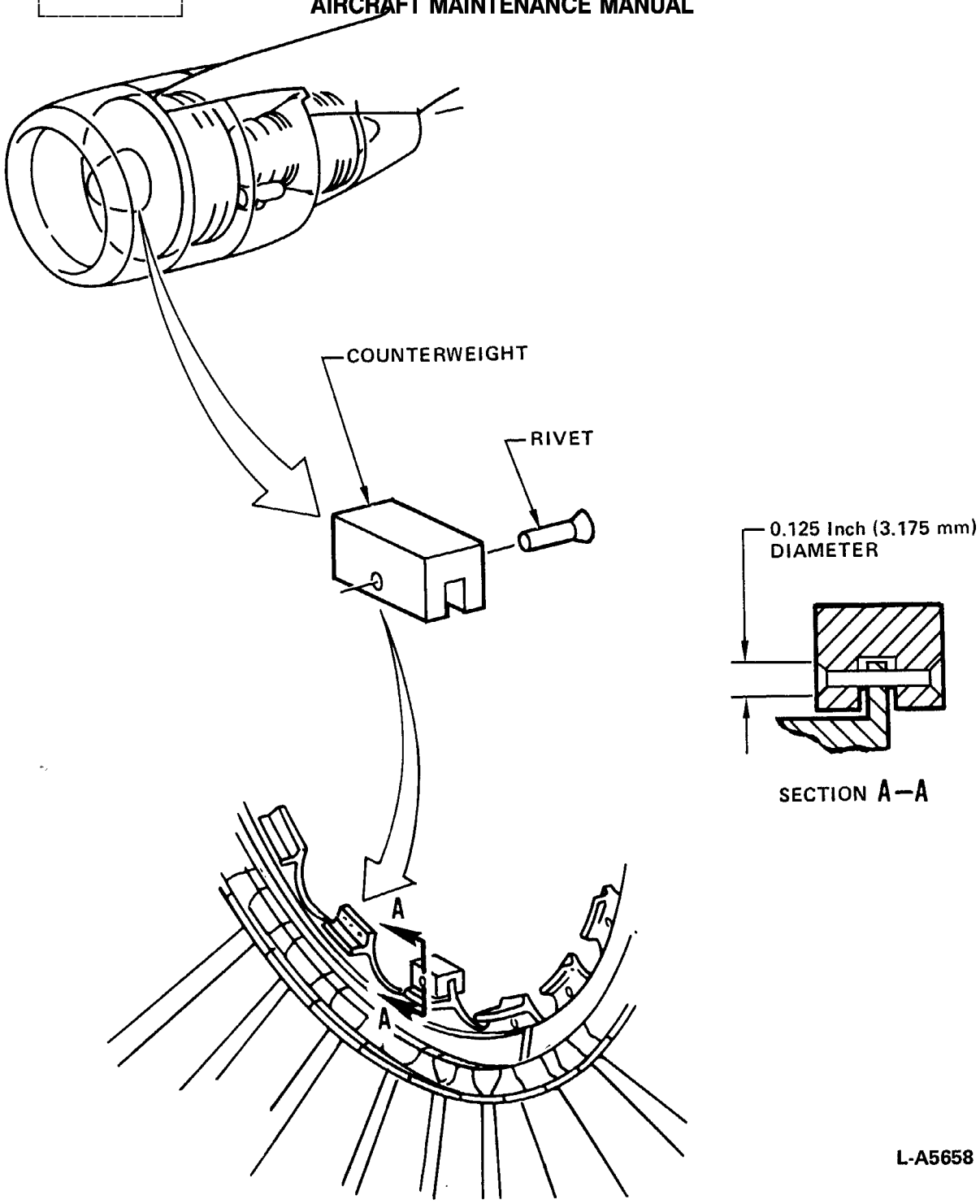
BM5 71 00 00 5 KETJ 00

Trim Balance Equipment (Sheet 2)
Figure 512

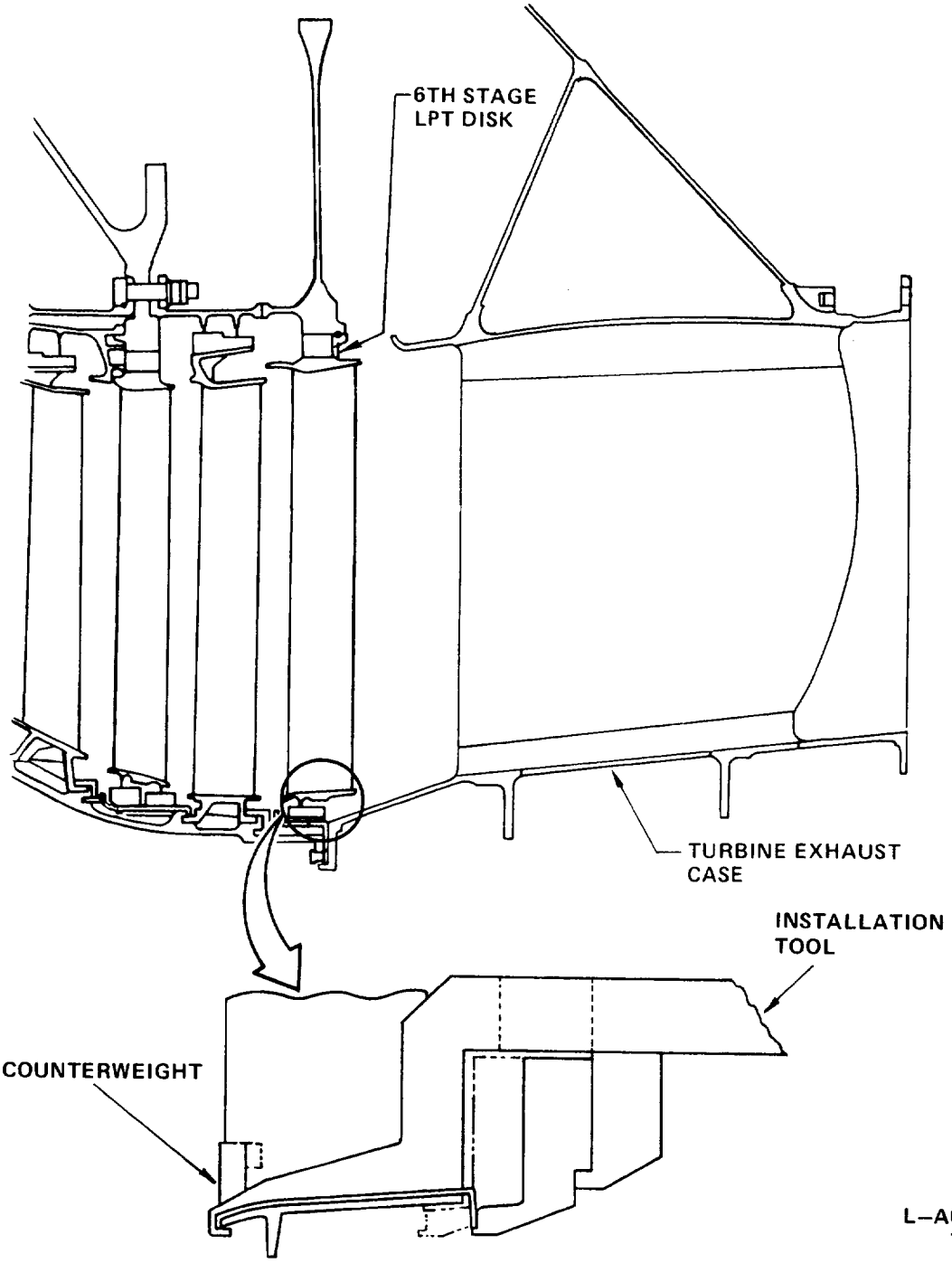


BM5 71 00 00 5 KCTO - 00

Turbine Shaft Plug
Figure 513

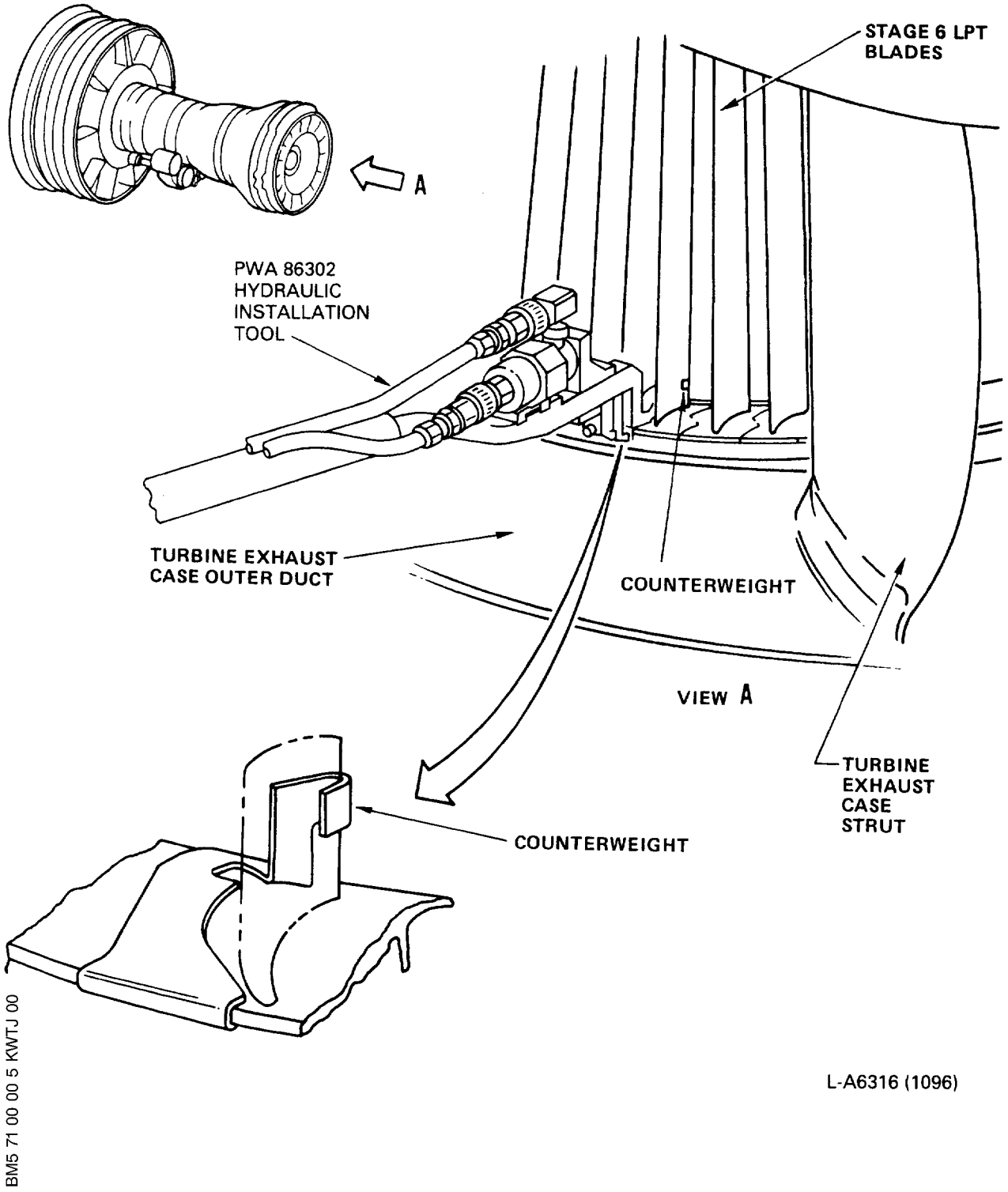


Counterweight Installation On the Fan Plane
Figure 514

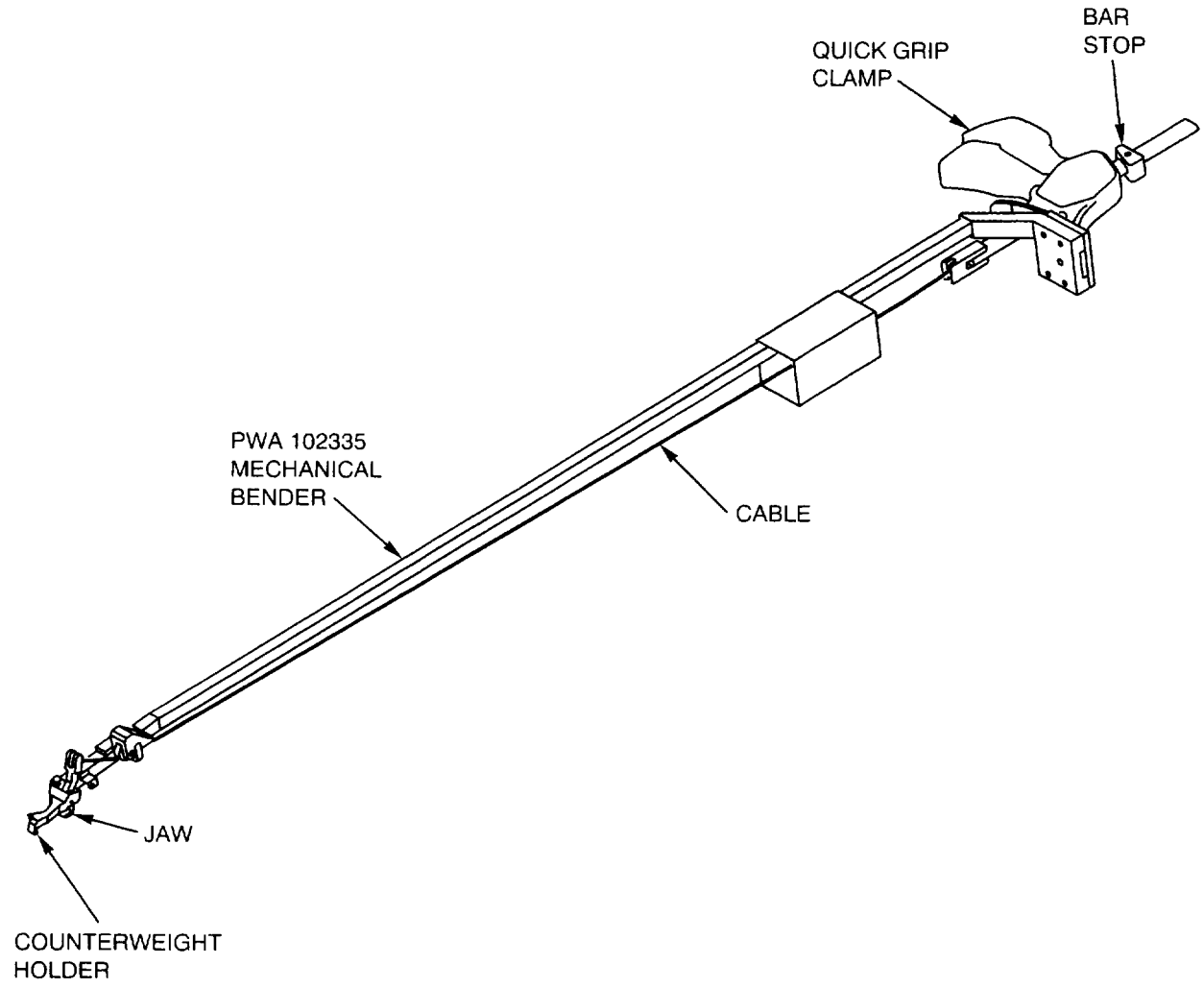


BM5 71 00 00 5 KWTA 00

Counterweight Installation On the 6th Stage LPT Blades
(Sheet 1/4)
Figure 515



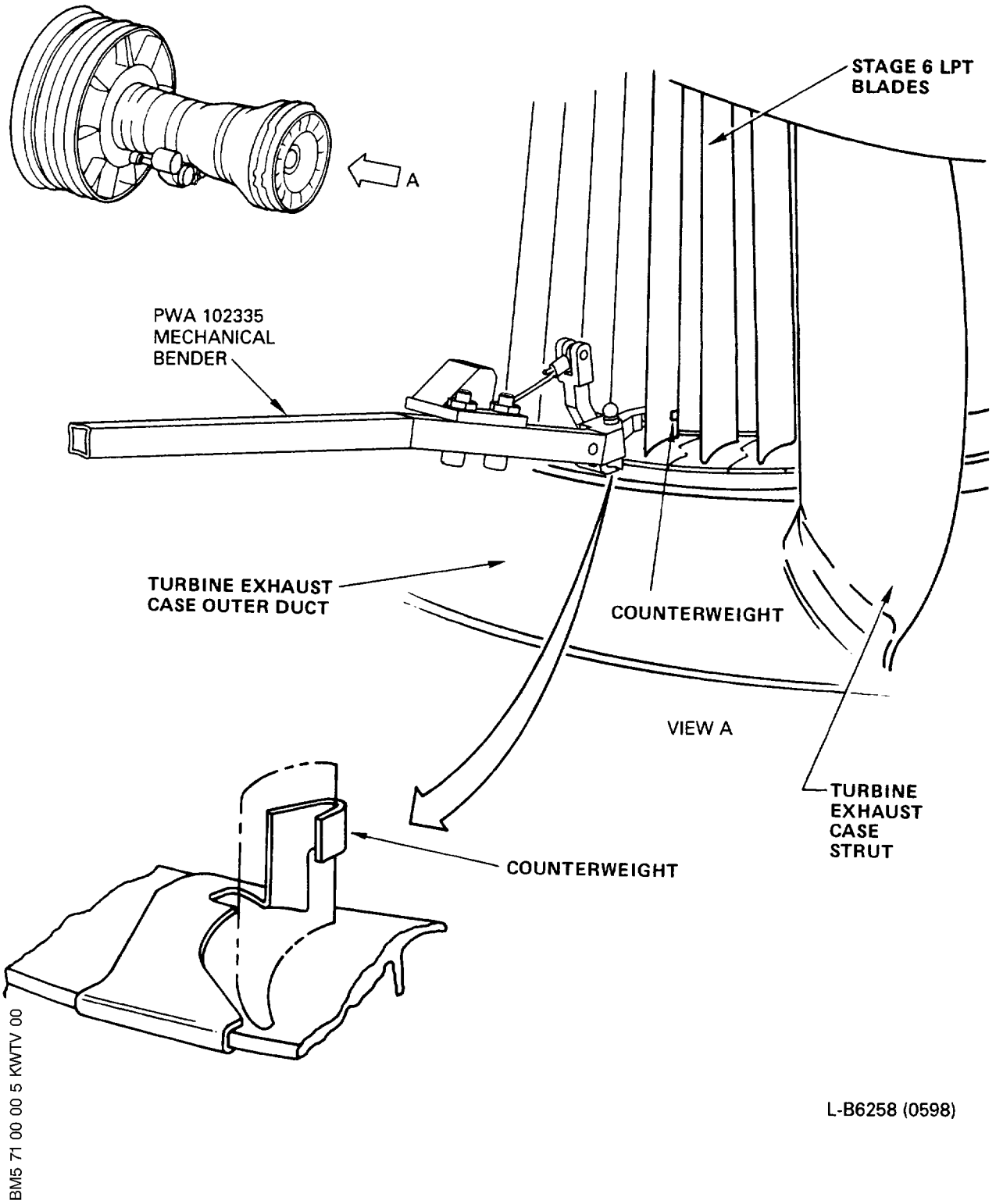
Counterweight Installation On The 6th Stage LPT Blades
Installation With Hydraulic Bender PWA86302 (Sheet 2/4)
Figure 515



BM5 71 00 00 5 KWTS 00

L-B6257 (0598)
PW V

Counterweight Installation On The 6th Stage LPT Blades
Installation With Mechanical Bender PWA102335 (Sheet 3/4)
Figure 515



Counterweight Installation On The 6th Stage LPT Blades
Installation With Mechanical Bender PWA102335 (Sheet 4/4)
Figure 515

G. PBS-4100/EVM Trim Balance

(1)General

(a)It is recommended that this trim balance procedure be performed by personnel that are trained in the use and operation of the PBS-4100 portable trim balancing system and have experience with engine trim balance.

(b)This method uses the aircraft EVM and the PBS-4100 portable balancing system. The PBS-4100 is plugged into the EVM signal conditioner. The PBS-4100 collects the vibration data and calculates a balance solution. This method is used to lower fan ("A" flange) vibration levels only. This procedure should not be used to correct cabin noise problems.

(c)A fan plane balance will affect the low rotor vibration levels on both the fan ("A" flange) and turbine ("P" flange) cases. Because the EVM only has vibration pick-ups on the fan case, the affect of a fan plane balance on the turbine case will not be known. Therefore, this procedure limits the amount of weight that can be installed to the fan balance flange. A turbine plane balance cannot be done using this procedure.

(d)This procedure describes the following :

1 Listing of available fan and turbine plane counterweights.

2 Instructions for the installation of the counterweights.

3 Engine test requirements.

4 Supplemental PBS-4100 operation and setup information.

(2)Equipment and Materials

ITEM	DESIGNATION
A.	Packing
B.	Counterweights
C.	Rivet
D.	Cotter pin
E.	Engine Selector Switch Box (PN 8115-6712)
F.	PBS Jumper Cable (PN 8115-6713)
G.	EVM Interface Cable (PN 8115-6508)
H.	EVM Interface Cable (PN 8115-6711)
J.	PBS-4100 Portable Balancing System (Data Acquisition Unit And Computer) (PN 7000-4133)
K. PWA85234	Riveter
L. PWA85306	Puller
M. Material No.P03-001	Oils (Ref. 70-00-00)
N. Material No.P05-018	Special Materials (Ref. 70-00-00)
P. Material No.P05-026	Special Materials (Ref. 70-00-00)
Q. Material No.P06-002	Lubricant (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 201	Power Plant - General
- 72-21-01, P. Block 401	Inlet Cone
- 77-32-00, P. Block 1	Engine Vibration Indicating

(3)General

NOTE : If vibration occurred after fan blade replacement, the replaced

blades should be inspected to make sure that the moment weight pairs do not exceed 1.0 oz-in (720 g.mm) difference.
The moment weight is marked on the concave airfoil surface inboard of the mid-span shroud. If necessary, replace with a different set of moment weight fan blade pair.

CAUTION : TRIM BALANCE SHOULD NOT BE USED TO CORRECT VIBRATION CAUSED BY MECHANICAL PROBLEMS.
EXAMPLES OF THIS TYPE OF PROBLEM ARE :

INCORRECT ASSEMBLY - INCORRECT ASSEMBLY DURING ENGINE OVERHAUL OR REPAIR CAN BE SHOWN BY VIBRATION LEVERS LARGER THAN TWICE THE VIBRATION LIMIT. SEE VIBRATION LIMITS (REF. 71-00-00, P. BLOCK 201).

DAMAGE TO ROTOR PARTS - PART DAMAGE MUST BE REPAIRED BEFORE ENGINE TRIM BALANCE.

(a) Trim balance can decrease engine vibration. The trim balance procedure adds a small amount of weight to correct unbalance. The weight(s) are installed on the compressor front balance plane and the turbine rear balance plane. The trim balance procedure can be done on the engine while it is on the airplane.

(b) Trim balance is only used to correct stable low rotor related (1EL) vibration.

(c) The total vector sum of the trim balance weights and the weights installed for component (LPC) balance must not be more than the limits that follow :
Fan plane : 20 oz-in. (14,400 g.mm)
Engines that require more correction weight than allowed must be trim balanced using the PBS-4100 Dual Pick-up Procedure.

(d) Identify all the trim balance weights permanently with the letters "TB".
NOTE : The balance weights installed on the fan hub during LPC balance are not identified with the letters "TB".

(e) If the sum of the low rotor and the high rotor vibration does not equal the total vibration, then some N1 or N2 related vibration harmonics or noise caused by the equipment (leads and pick-ups) can be present. The total vibration limit applies to the square root of the sum of the N1 vibration squared plus the N2 vibration squared.

(f) The first trial balance weights are identified as CW1, the second weights CW2, the third weights as CW3, etc.

(g) Definitions :
1 1EL : The low rotor related vibration.
2 Vibration Units : Measure vibration displacement in mils (mm) or vibration velocity in inches per second (mm per second).
1 mil = 0.001 Inch (0.025 mm)
3 Phase Angle Lag : The angle the low rotor turns during the time the "heavy point" goes by the vibration transducer and the effect of this is shown.
4 Phase Angle : The angle between the signal from the vibration transducer and the signal from the once per revolution N1 speed reference.

NOTE : This procedure uses phase measurement equipment that measures from the N1 speed pulse to the vibration pulse (maximum).
Measure positive angles, in this coordinate system, in the opposite direction from the direction in which the engine turns (lag angle). Some phase measurement equipment, such as MTI PBS-4000 equipment, measure positive angles in the direction in which the engine turns (lead angle). The PBS-4100 can be set to either lead or lag angle.

5 Sensitivity : The moment weight that causes 1.0 mil (0.025 mm) of vibration.

6 Once Per Revolution N1 Speed Reference : The short tooth of the tachometer gear on the turbine shaft coupling makes a signal to the N1 speed transducer once each revolution. As an alternative method, use an optical tachometer for the once per revolution N1 speed reference.

7 N1 Reference Blade : Fan blade ink marked for reference to short tooth location.

8 Stable Vibration : Stable vibration is a vibration of which the maximum does not change by more than one quarter of the average (vibration) during 30 seconds of engine operation.

9 Vibration Survey : The process to get and record the engine vibration data versus rotational speed during an engine acceleration /deceleration. This is used to document that an engine is within the vibration limits. It is also used to identify peak vibration levels at certain engine speeds which are not within the vibration limits.

10 Trim Balance Survey : This survey is done after or during the Vibration Survey. The engine is tested at predetermined N1 speeds. The (1EL) low rotor engine vibration amplitude and phase angle data are recorded at each of the predetermined N1 speeds.

(4)Procedure

(a)Install the trim balance equipment (Ref. Fig. 516)

1 Locate EVM Signal Conditioner (Ref. 77-32-00, P. Block 1).

2 Connect Interface Cable (PN 8115-6508) to EVM front panel maintenance connector.

3 Connect Interface Cable (PN 8115-6508) to Interface Cable (PN 8115-6711).

4 Route Interface Cable (PN 8115-6711) to PBS-4100 location in the aircraft.

5 Connect Interface Cable (PN 8115-6711) to switch box (PN 8115-6712).

6 Connect Jumper Cable (PN 8115-6713) to switch Box (PN 8115-6712) and to the PBS-4100 Data Acquisition Unit.

7 Connect PBS-4100 Data Acquisition Unit to the PBS-4100 Computer.
NOTE : Refer to the PBS-4100 equipment manual for installations instructions of the PBS-4100 (PN 7000-4133).

(b)Find the mark (recess) that refers to the once per revolution N1 speed signals as follows :

1 Use a Silver Pencil (Material No.P05-018) and mark the inlet cone front segment and the inlet cone (rear) segment for alignment during installation.

2 Remove the compressor inlet cone front segment (Ref. 72-21-01,

P. Block 401).

3 Remove the key washer retaining ring and the retaining nut key washer which holds the turbine shaft plug, at the front of the coupling. Use a PWA85306 Puller to remove the plug. Discard the packing. (Ref. Fig. 513)

4 Find the small recess on the end of the turbine shaft coupling assembly. This recess shows the location of the short tooth which makes the signal for the N1 speed transducer. Mark the fan blade which is aligned with this recess, using Ink (Material No.P05-026), in an easily seen location.

5 Install a new packing lubricated with Petrolatum White (Material No.P06-002), to the turbine shaft plug.
Install the plug to the coupling ID and install the key washer and the retaining ring.
NOTE : Make sure retaining ring is fully inserted in the retaining nut groove, all around, and ring end gap is 0.01 in. (0.254 mm).

6 Make a mark on the fan blade rubstrip, with Silver Pencil (Material No.P05-018), at the 12:00 o'clock position.
NOTE : The fan is considered "indexed" when the mark on the fan blade is aligned with the mark on fan blade rubstrip.

7 Examine the hub flange for installed counterweights. Check each counterweight for the letters "TB" marked on the inner diameter face. Record part number and tang location of all counterweights marked "TB".
NOTE : After the fan is indexed, the tang at the 12:00 o'clock position is the No. 1 tang. The tangs are numbered 1 through 19 in the clockwise direction.

8 If weights marked "TB" are installed, use the "Trial Weight Balancing" option on the computer.

9 If weights marked "TB" are not installed, use the "Stored Influence Coefficient Balancing" option on the computer.

10 Install the compressor inlet cone (Ref. 72-21-01, P. Block 401).

(c)Do the vibration/trim balance survey as follows :
NOTE : You must have a thermally stable engine before you do the vibration/trim balance survey.

1 Start the engine and operate at IDLE power. (Ref. 71-00-00, P. Block 201).

2 Do a slow acceleration to 1.3 EPR power and stay at this power for three minutes.

3 Decrease the power to IDLE and operate at this power for six minutes.
NOTE : You now have a thermally stable engine.

4 Perform a vibration survey by Engine Test No. 8 which is a slow accel (90 - 120 seconds) to 90% N1 (3250 RPM). During this SLOW ACCEL stop at the following N1 speeds and record stable trim balance data on (Ref. Fig. 517).

82% N1 (2950 RPM) speed
90% N1 (3250 RPM) speed

NOTE : The PBS-4100 software V2.21 and higher will permit you to take trim balance data during the vibration survey. If the software is pre V2.21, the vibration survey and the trim balance must be done separately.

5 After the accel vibration survey do a decel vibration survey by Engine Test No. 8 which is a slow decel (90 - 120 seconds) to idle.

NOTE : Trim balance data is only taken during the accel vibration survey.

6 Stabilize at idle for 5 minutes and then do an engine shutdown (Ref. 71-00-00, P. Block 201).

(d)Procedures necessary after the first vibration/trim balance survey

1 Remove the compressor inlet cone front segment (Ref. 72-21-01, P. Block 401).

2 Index the fan by aligning the marked fan blade with the mark on the fan rubstrip at the twelve o'clock position.

NOTE : After the fan is indexed, the tang at the 12:00 o'clock position is the No. 1 tang. The tangs are numbered 1 through 19 in the clockwise direction.

3 Examine the hub flange for installed counterweights. Check each counterweight for the letters "TB" marked on the inner diameter face. Record part number and tang location of all counterweights marked "TB". Remove all the counterweights marked "TB".

4 If weights marked "TB" were removed, input their weights (PBS class number) and location (tang number) into the PBS-4100 computer. The PBS class number must be input as a negative (-) number.

5 If "TB" weights were removed go to the next step 6. If the counterweights marked "TB" are not present, install counterweights No. 1 (CW1) trial weights to the fan balance ring as directed by the PBS-4100 computer.

NOTE : Use "Stored Influence Coefficient Balancing" option to determine CW1 weight location. Fan counterweights can be temporarily installed by using a cotter pin (MS9245-45).

6 Install the compressor inlet cone. (Ref. 72-21-01, P. BLock 401).

7 Perform vibration/trim balance survey. See step (c).

(e)If the vibration levels are satisfactory, remove the trim balance equipment by Step (h).

(f)If the vibration levels are not satisfactory do the steps that follow :

1 Using the "PREDICT" feature of the PBS-4100 determine if the PBS-4100 fan plane balance solution will reduce the vibration to satisfactory levels.

2 If changing the amount and location of the fan plane counterweights will reduce the vibration to satisfactory levels, use a cotter pin (MS9245-45) and install the counterweight(s) to the fan balance hub as directed by the PBS-4100 computer. See Table 503. Repeat vibration/trim balance survey, step (c). If the vibration levels are reduced to satisfactory levels permanently install the fan counterweights. See step (g).

NOTE : Using a cotter pin to secure a counterweight is a temporary installation.

CLASS	COUNTERWEIGHT WITH COTTER PIN (MS9245-45)
	Counterweight (534493)
1	2.0 oz-in (1440 g.mm)
2	2.4 oz-in (1728 g.mm)
3	2.8 oz-in (2016 g.mm)
	Counterweight (534495)
1	4.9 oz-in (3528 g.mm)
2	5.3 oz-in (3816 g.mm)
3	5.7 oz-in (4104 g.mm)
4	6.1 oz-in (4392 g.mm)
5	6.5 oz-in (4680 g.mm)
	Counterweight (1B4294)
	12.8 oz-in (9216 g.mm)

Fan Plane Trim Balance Counterweights
Table 503

3 If the vibration levels are not satisfactory, use the PREDICT feature of the PBS-4100 to find out if the "A" flange vibration values can be reduced to satisfactory levels by adding less than 50 oz-in. (36,000 g.mm). If the answer is yes, install the PBS-4100 equipment and do the PBS-4100 Dual Pick-up Trim Balance Procedure. This procedure will add counterweights to the fan plane and the LPT 6th stage blades and do the vibration/trim balance survey again. If the answer is no, replace the engine.

(g)Install the permanent fan plane counterweight(s).

1 Record the location and the moment weight of all the trial balance weights.

NOTE : Vibro peen the letters "TB" on the inner diameter face of all the trim balance counterweights.

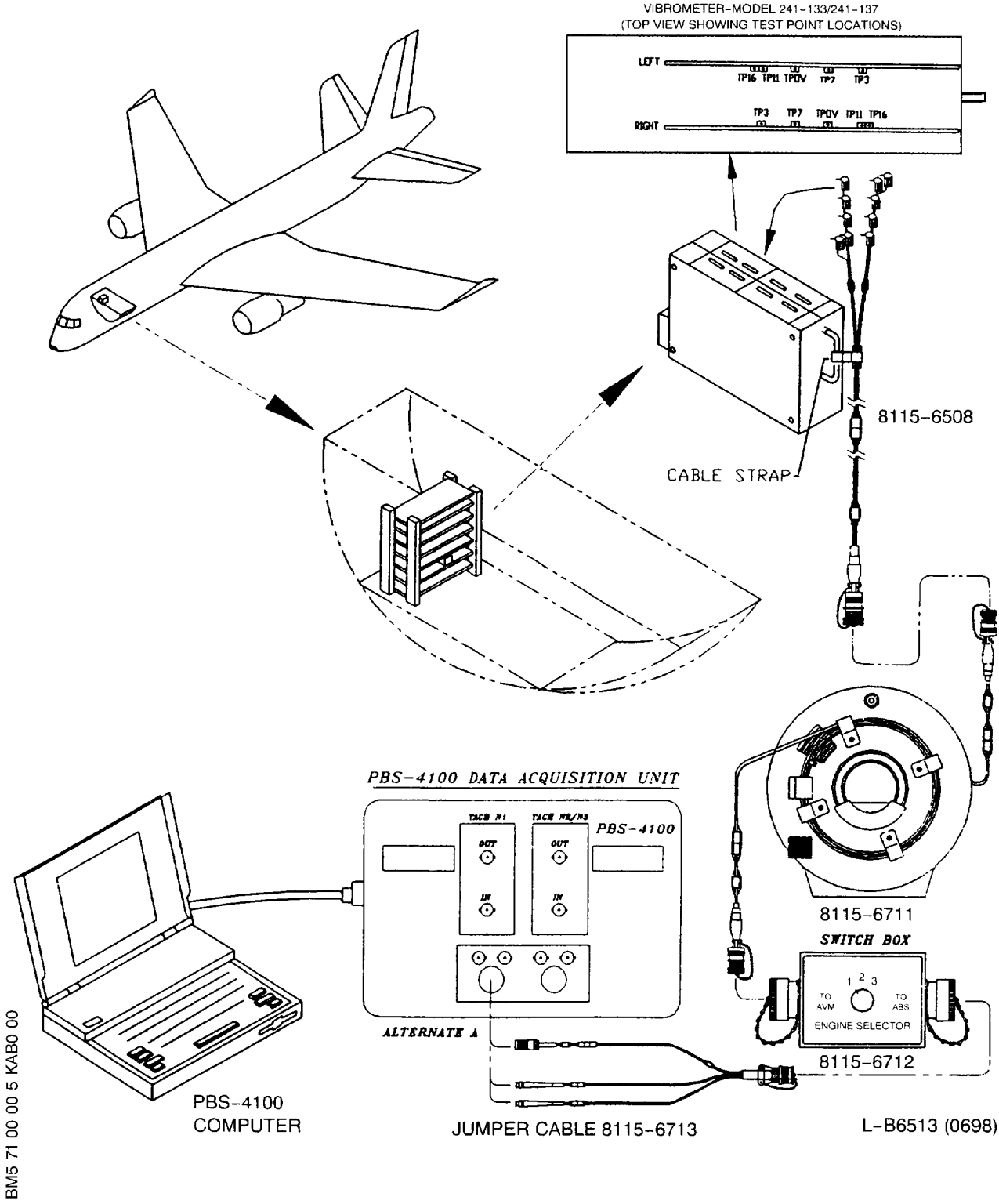
2 Install the counterweight(s) with a rivet. See Table 503. Use a PWA85234 Riveter to make a 0.125 in. (3.175 mm) diameter head on the rivet. (Ref. Fig. 514)

3 Align the pencil mark on the inlet cone front segment with the pencil mark on the inlet cone (rear) segment. Install the cone front segment with six washers and bolts, lubricated with Engine Oil (Material No.P03-001). Tighten and TORQUE bolts to between 45 and 50 lbf.in. (0.51 and 0.56 m.daN).

4 Operate the engine with the counterweights installed. See Engine Test No. 8. Make sure that the engine vibration is within limits.

(h)Remove the test equipment from the engine.

1 Remove the interface cable, jumper cable and engine selector switch box.



BM5 71 00 00 5 KAB0 00

Trim Balance Equipment Installation
Figure 516

TRIM BALANCE DATA WORKSHEET

AIRCRAFT NO. _____ ENGINE POSITION ___ ENGINE S/N _____

ENGINE MODEL _____ RUN NO. ___ RUN TYPE _____ DATE _____

PICK – UP	N1	PHASE (DEG)	DISPL (MILS)	REMARKS

TRIM BALANCE DATA WORKSHEET

AIRCRAFT NO. _____ ENGINE POSITION ___ ENGINE S/N _____

ENGINE MODEL _____ RUN NO. ___ RUN TYPE _____ DATE _____

PICK – UP	N1	PHASE (DEG)	DISPL (MILS)	REMARKS

L – A9232 (0000)
PW V

BM5 71 00 00 5 KBM0 00

Trim Balance Data Worksheet Example
Figure 517

H. Test No. 1 - Pneumatic Leak Test

NOTE : - For static pneumatic system leak check (Ref. 36-11-00, P. Block 601).

(1)Equipment and Materials

ITEM	DESIGNATION
(a)Material No.P05-034	Special Materials (Ref. 70-00-00)
(b)Material No.P05-110	Special Materials (Ref. 70-00-00)
(c)Material No.P05-169	Special Materials (Ref. 70-00-00)

(2)General

(a)The purpose of this test is to leak check the engine/aircraft pneumatic system interface.

(b)Refer to 71-00-00, P. Block 201 for engine operating limits.

(3)Prepare engine for pneumatic test.

(a)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(b)Foil wrap lockwire (Material No. P05-110) and (Material No. P05-169) (Ref. Fig. 518) or put developer (Material No. P05-034) on the pneumatic joints identified in referenced figures. (Ref. Fig. 519, 520, 521).

(c)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P.Block 301).

(4)Procedure

(a)Prepare and start engine as described for normal engine operation in 71-00-00, P. Block 201.

1 Allow N2 RPM to stabilize at idle for five minutes.

2 Verify that operating indications are within operating limits.

(b)Shut down engine as described for normal operation (Ref. 71-00-00, P. Block 201).

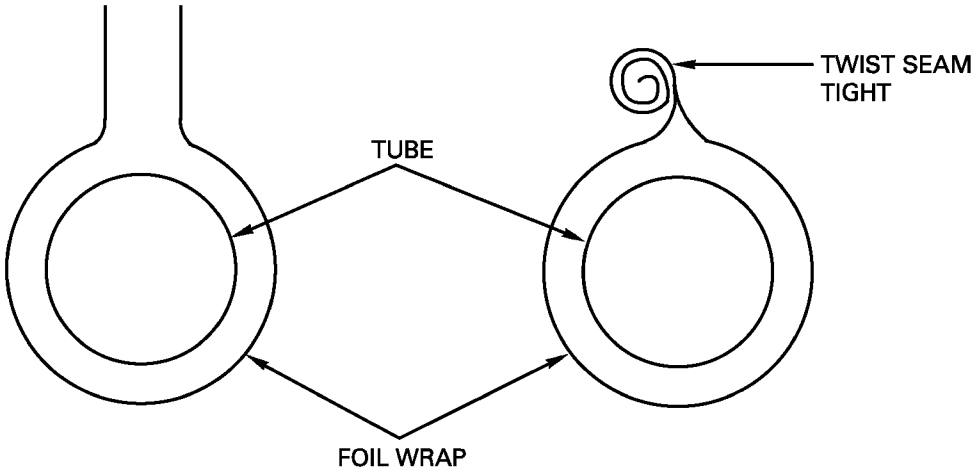
(c)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(d)Inspect for pneumatic leaks. Foil wrap will expand and rip if a leak is present ; developer will show streaks at leak location if leak is present.

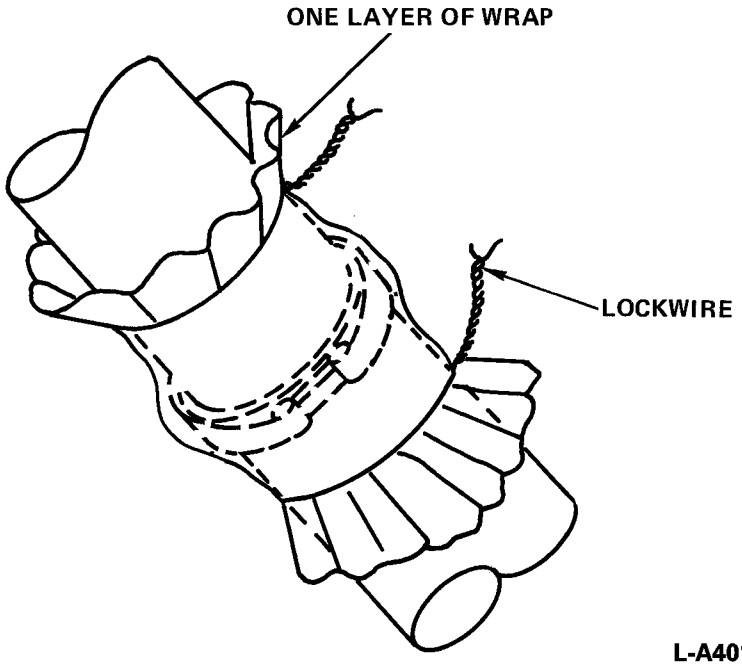
(e)Repair as necessary.

(f)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(g)Retest as necessary.



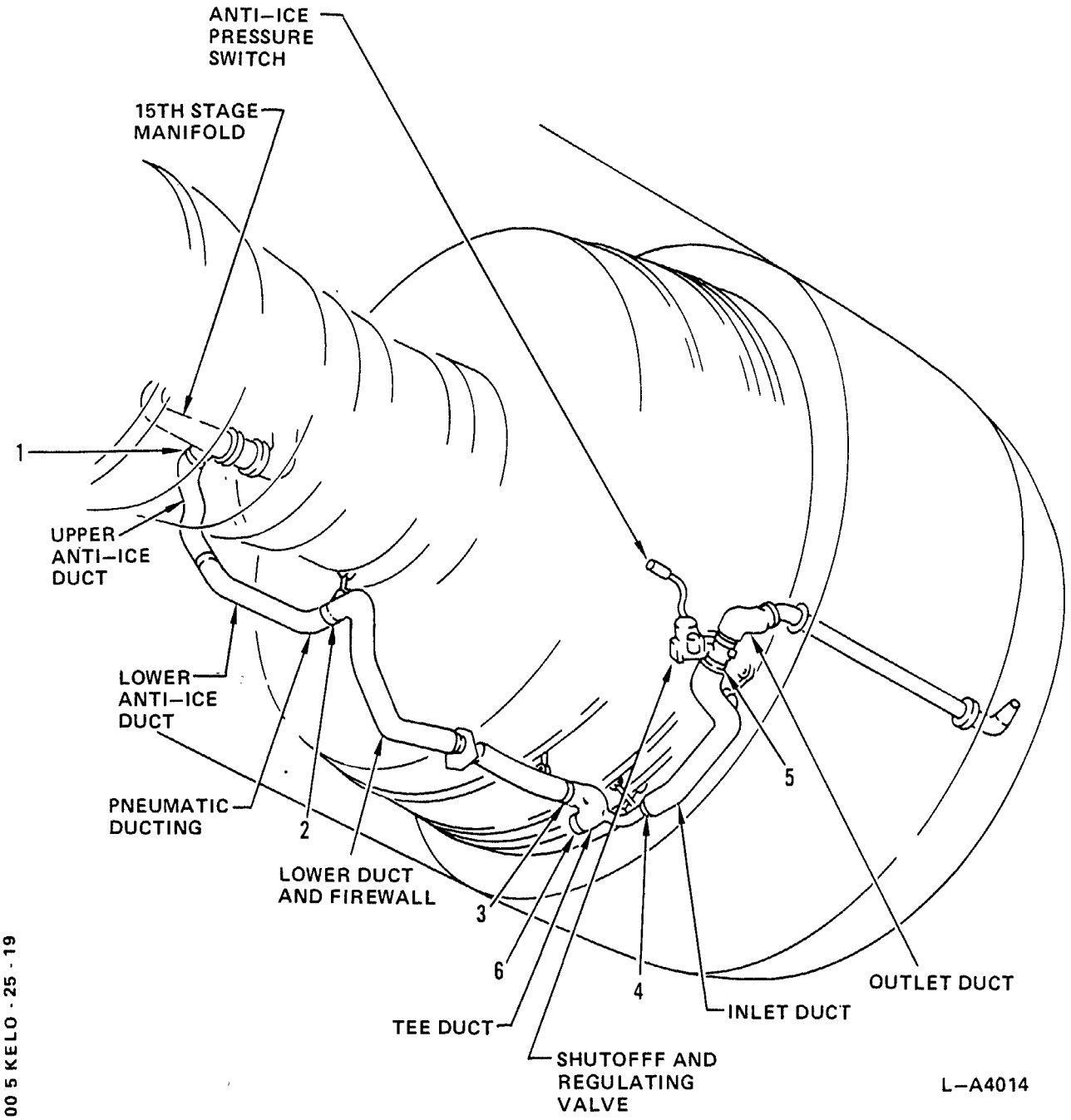
TYPICAL CROSS-SECTION OF FOIL WRAP



L-A4013 (0692)

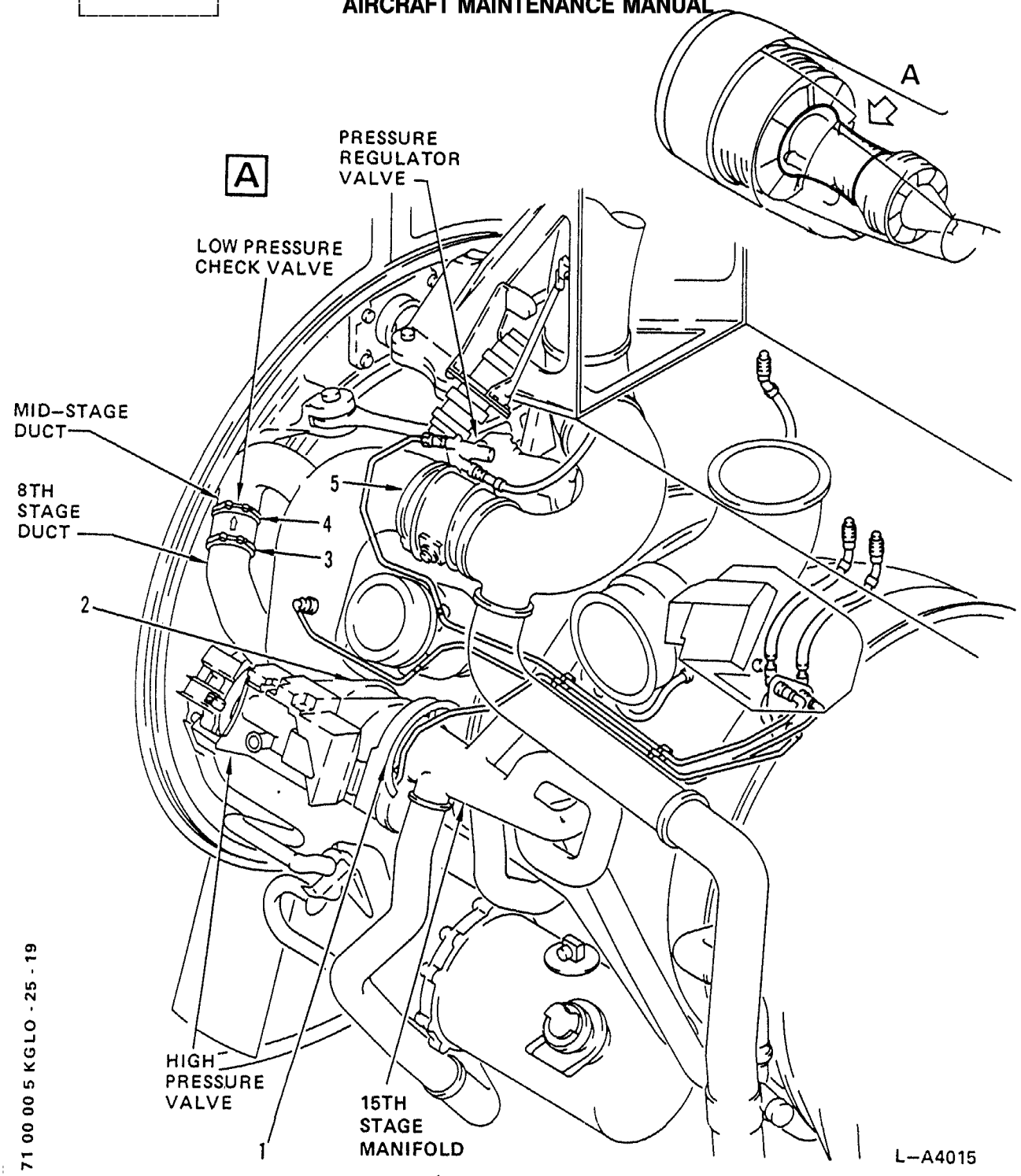
BM5 710000 5 KCL0 01

Aluminum Foil Wrap Installation of Couplings
Figure 518

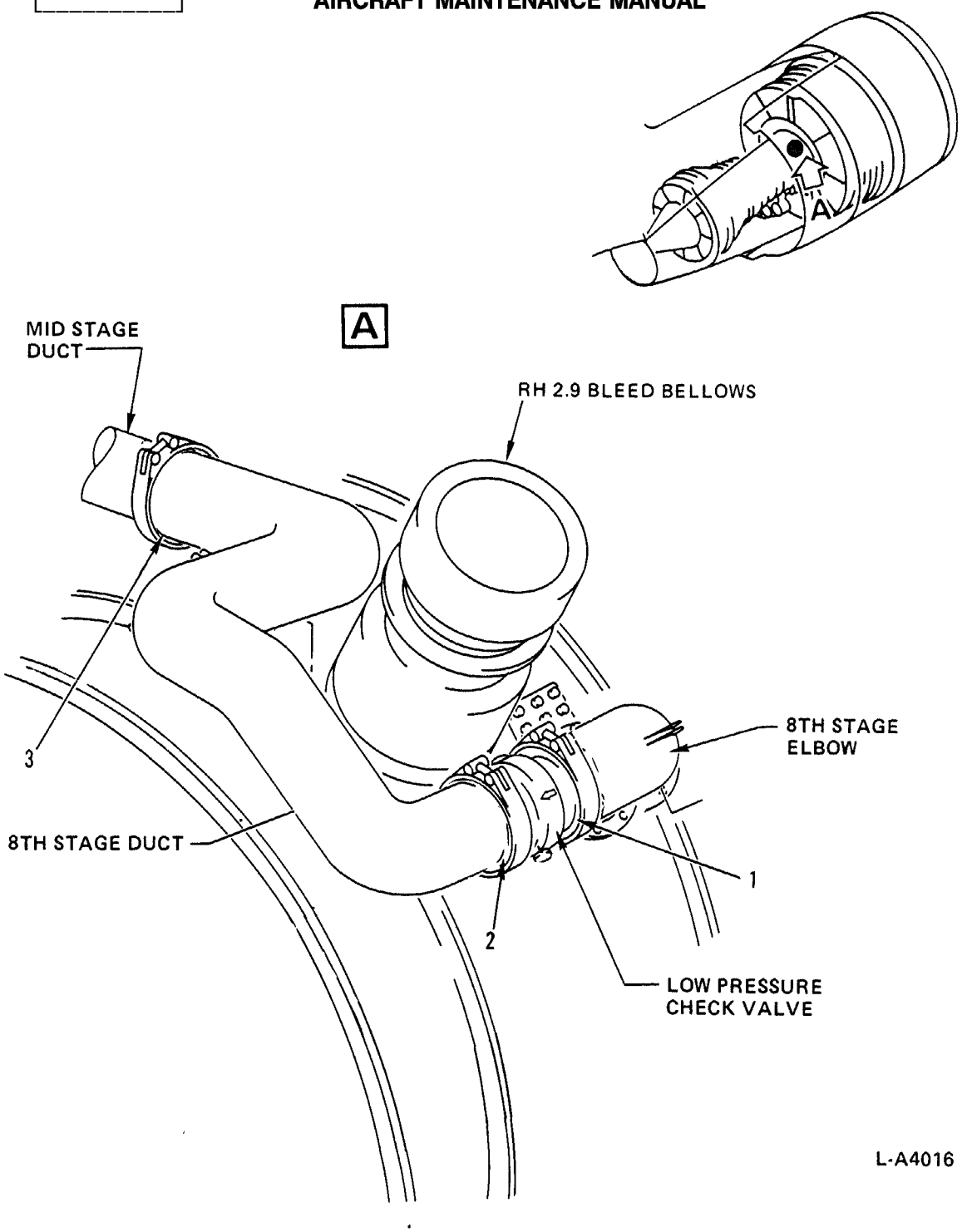


BM5 71 00 00 5 KELO · 25 · 19
DM5

Inlet Anti-Icing System Couplings to Aluminium Foil Wrap
Figure 519



Pneumatic System Couplings to Aluminium Foil Wrap
Figure 520



BM5 71 00 00 5 KHLO - 25 - 19
DM5

Pneumatic System Coupling to Aluminium Foil Wrap
Figure 521

R J. Test No. 2 - Dry Motoring - Wet Motoring

WARNING : MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROL SURFACES ARE CLEAR BEFORE MOTORING THE ENGINE. MOVEMENT OF THE FLIGHT CONTROL SURFACES CAN BE DANGEROUS AND/OR CAUSE DAMAGE.

WARNING : DO NOT PERFORM WET MOTORING IN A HANGAR OR IN A CLOSED AREA. A LARGE QUANTITY OF HIGHLY FLAMMABLE FUEL VAPORS COME OUT FROM THE ENGINE DURING THIS PROCEDURE AND THERE IS A RISK OF FIRE.

CAUTION : PRIOR TO STARTING ENGINE, CHECK THAT THE THRUST REVERSER CONTROL LEVERS ARE IN STOWED POSITION AND THRUST REVERSERS ARE FUNCTIONALLY CLEARED TO STOW.

CAUTION : DO NOT EXCEED OPEN COWLING LIMITATIONS DURING TESTING.

CAUTION : OPERATOR MUST BE THOROUGHLY FAMILIAR WITH OPERATING LIMITS BEFORE RUNNING ENGINE.

CAUTION : DO NOT ATTEMPT TO STOP FAN ROTATION BY HAND.

NOTE : There is possibility to have an intercommunication between ground crew and flight compartment during engine motoring by using the appropriate phone jack (Ref. 23-44-12, P. Block 401).

(1)Equipment and materials

ITEM	DESIGNATION
(a)PWA102757	Block, Wedge (2 Necessary - Only for Optional Procedures)
Referenced Procedures	
R - 12-13-24, P. Block 1	Oil - Electrical Power
R - 12-13-79, P. Block 1	Oil - Engines
R - 12-13-80, P. Block 1	Oil - Starting System
R - 23-44-12, P. Block 401	Maintenance Interphone Jack
R - 24-41-00, P. Block 301	AC External Power Control
R - 26-12-00, P. Block 501	Engine Fire and Overheat Detection
R - 26-21-00, P. Block 501	Engine Fire Extinguisher
R - 31-51-00, P. Block 201	Ecam - General
R - 36-22-00, P. Block 501	Manifold Air Leak Detection
R - 80-00-00, P. Block 201	Starting - General
R - 80-11-00, P. Block 1	Control and Indicating

(2)Job set-up

NOTE : Procedure is identical for LH and RH engines.

NOTE : Job Set-Up is similar for :
- Dry motoring
- Wet motoring

(a)Make certain that aircraft is headed into the wind to prevent that exhaust gas ingestion by engine.

(b)Make certain that landing gear ground safeties including wheels chocks are in position.

(c)Remove engine inlet and exhaust covers.

(d)Check that pylon pressure relief doors are closed.

(e)Check engine air intakes.

1 Check the absence of foreign objects.

2 Check that fan blades and spinner are in correct condition.

3 Check that fan rotates freely.

4 Check that air intake skin is in correct condition.
NOTE : If an engine has been exposed to freezing air, ice and snow may have accumulated in the fan section and low pressure turbine area. Whenever there is a possibility of this having occurred, the fan must be checked for free rotation prior to attempting a start. If rotation is hindered by ice or snow, heat areas affected with hot air prior to an engine start.

(f)Check fan reverser for damage, security of components and proper stowage.

(g)Check fan outlet and exhaust nozzle for correct condition and absence of foreign objects.

(h)Check anti-icing exit duct on nose cowl for clearance.

R (j)Check oil tank level (Ref. 12-13-79, P. Block 1).

R (k)Check IDG oil level (Ref. 12-13-24, P. Block 1).

R (l)Check starter oil level (Ref. 12-13-80, P. Block 1).

R (m)Check external surfaces of cowling and rain ports for evidence of hydraulic fluid, oil and fuel leakages.

R (n)Check that all access doors and cowls are closed and properly latched.

R (p)Check that safety areas are clean of equipment, tools, other foreign objects and personnel.

R (q)Check that fire fighting personnel is present.

R (r)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301). Make certain that electronics rack ventilation is correct.

R (s)Check operation of ignition systems. Properly operating igniters give 1 to 5 sharp cracking sounds per second.
NOTE : Check that there is no ignition when ENG/IGNITION selector switch is in CRANK position.

R (t)Check that all circuit breakers are closed.

R (u)On panel 9VU
- check that parking brake control handle is pulled.
- check that ENG 1 (ENG 2) HP fuel shut off valve control lever is in OFF position
- check that throttle control lever LH (RH) is in idle position.

R (v)On panel 4VU
- check that brake pressure indication on the triple indicator is correct (2000 psi).

If necessary repressurize the braking system using PARKING BRAKE ACCU PRESS pushbutton switch (8GX) on panel 9VU.
- check that landing gear normal control lever is in down position.

R (w)On overhead panel
1 Test fire detection loops (Ref. 26-12-00, P. Block 501).
2 Test ENG 1 (2) fire extinguisher bottle percussion (SQUIB TEST) (Ref. 26-21-00, P. Block 501).
3 Check that pylon and wing ambient overheat detection systems operate correctly (Ref. 36-22-00, P. Block 501).

R (x)Check that interphone system operates correctly. Contact the ground staff chief member.

R (y)Check that the aircraft is cleared and that nobody remains in the dangerous area.

R (aa)On panel 430VU
1 Check that fuel pumps operate correctly.

2 Check that flowbar of FUEL/ISOL VALVES/ENG 1 (ENG 2) pushbutton switches shows continuity.
3 Check that fuel quantity is sufficient for operation.

R (ab)On panel 427VU
1 Check that level of hydraulic fluid in tanks is correct.
2 Check that hydraulic system warnings operate correctly.
3 Check that HYD PWR/B, G, Y/PUMPS/ENG 1 (ENG 2) pushbutton switches are pressed (OFF legend off).
4 Check that hydraulic tanks are pressurized.

R (ac)On panel 471VU
1 Check that OPEN legends of all HYD/FIRE VALVES annunciators are on.

R (ad)On main instrument panel
1 Check that oil level indication on the indicator is correct.
2 Align the mobile index on the quantity displayed.
3 Select ENG page on the ECAM system (Ref. 31-51-00).

R (ae)Supply pneumatic power to engine starting system.
NOTE : Engine starting can be accomplished using any of the following sources :
- Pneumatic power from ground power unit to aircraft pneumatic system and external AC power.
- Pneumatic power from operating engine and external AC power.
- Pneumatic power from ground power unit connected to aircraft
- Pneumatic power from operating engine and DC electrical power from aircraft battery.
- Pneumatic and AC electrical power from auxiliary power unit (APU).

(3)Dry motoring (N1 and N2 Rotation)
WARNING : MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROL SURFACES ARE CLEAR BEFORE MOTORING THE ENGINE. MOVEMENT OF THE FLIGHT CONTROL SURFACES CAN BE DANGEROUS AND/OR CAUSE DAMAGE.
CAUTION : MAKE SURE THAT THERE IS NO HYDRAULIC GROUND POWER SUPPLY CONNECTED TO THE AIRCRAFT WHEN YOU DO THIS PROCEDURE. IF A GROUND POWER SUPPLY IS CONNECTED, THERE IS A RISK OF DAMAGE TO THE ENGINE PUMPS.
CAUTION : ENGINE DRIVEN HYDRAULIC PUMPS ARE HYDRAULIC FLUID LUBRICATED. DO NOT MOTOR ENGINE UNLESS HYDRAULIC TANK PRESSURE VALUE IS WITHIN NORMAL OPERATING RANGE.
CAUTION : DURING COLD WEATHER, FULL SCALE OIL PRESSURE SURGES MAY OCCUR.

(a)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG1/FUEL HP VALVE/CTL	3KC	333/T69
133VU	ENGINES/ENG2/FUEL HP VALVE/CTL	4KC	333/T70
133VU	ENGINES/ENG2/IGNITION/SYS A	8JH	333/T71
133VU	ENGINES/ENG1 & 2/IGNITION/SYS B	2JH	333/T72
133VU	ENGINES/ENG1/IGNITION/SYS A	1JH	334/S72

(b)Make certain that ENGINES/ENG1&2/START CTL& WARN (1KG) circuit breaker is closed.

(c)On panel 430VU

CAUTION : HP FUEL SHUT OFF VALVE CONTROL LEVER MUST BE IN OFF POSITION BEFORE FUEL BOOST PUMPS ARE TURNED ON.

- press all FUEL/PUMPS pushbutton switches (OFF legend off).

(d)On panel 429VU

1 Place ENG/IGNITION selector switch in CRANK position.
- White ARM legend on ENG1(2)/START pushbutton switch comes on.
- LH and RH air conditioning packs close.

2 Press ENG1(2)/START pushbutton switch.
If APU is used, APU rating increases to 101.4% (40712 RPM).
- white ARM legend goes off.
- start valve opens.
- blue OPEN legend comes on.
- starter is engaged.

(e)On panel 437VU

- check that starting air pressure is approximately 30 psi.

NOTE : If start valve fails to open automatically, it can be opened manually, respecting safety area access (Ref. 80-00-00, P. Block 201).

(f)Motor engine with starter for 10-20 seconds and monitor oil pressure for increasing indication, N1 and N2 for rotation.

NOTE : Starter operating limits must be observed. (Ref. 80-11-00, P. Block 1)

(g)Place ignition selector switch in OFF position.
- ENG1(2)/START pushbutton switch is released and OPEN legend goes off.
- air conditioning packs open.
- start valves close.

(h)On panel 430VU

- release all FUEL/PUMPS pushbutton switches (OFF legend on). (when compressors stop rotating).

R (j)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R (k)Inspect the oil and fuel system lines, fittings and accessories for leakage.

R (l)Remove safety clips and tags and close circuit breakers 1JH, 2JH, 8JH, 3KC and 4KC.

(4)Dry motoring (Optional - No N1 Rotation)

WARNING : MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROL SURFACES ARE CLEAR BEFORE MOTORING THE ENGINE. MOVEMENT OF THE FLIGHT CONTROL SURFACES CAN BE DANGEROUS AND/OR CAUSE DAMAGE.

CAUTION : MAKE SURE THAT THERE IS NO HYDRAULIC GROUND POWER SUPPLY CONNECTED TO THE AIRCRAFT WHEN YOU DO THIS PROCEDURE. IF A GROUND POWER SUPPLY IS CONNECTED, THERE IS A RISK OF DAMAGE TO THE ENGINE PUMPS.

CAUTION : ENGINE DRIVEN HYDRAULIC PUMPS ARE HYDRAULIC FLUID LUBRICATED. DO NOT MOTOR ENGINE UNLESS HYDRAULIC TANK PRESSURE VALUE IS WITHIN NORMAL OPERATING RANGE.

CAUTION : DURING COLD WEATHER, FULL SCALE OIL PRESSURE SURGES MAY OCCUR.

(a)Carefully install two PWA 102757 Wedges between two fan blades and the

fan case at approximately the 6 o'clock position. The thinnest edge of the wedge must be centered onto the leading edge of the fan blades and then tapped into position, along the blade chord line, until they fit tightly in the fan blade to case clearance gap (Ref. Fig. 522).

R (b)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG1/FUEL HP VALVE/CTL	3KC	333/T69
133VU	ENGINES/ENG2/FUEL HP VALVE/CTL	4KC	333/T70
133VU	ENGINES/ENG2/IGNITION/SYS A	8JH	333/T71
133VU	ENGINES/ENG1 & 2/IGNITION/SYS B	2JH	333/T72
133VU	ENGINES/ENG1/IGNITION/SYS A	1JH	334/S72

R (c)Make certain that ENGINES/ENG1&2/START CTL& WARN (1KG) circuit breaker is closed.

R (d)On panel 430VU

CAUTION : HP FUEL SHUT OFF VALVE CONTROL LEVER MUST BE IN OFF POSITION BEFORE FUEL BOOST PUMPS ARE TURNED ON.

- press all FUEL/PUMPS pushbutton switches (OFF legend off).

R (e)On panel 429VU

1 Place ENG/IGNITION selector switch in CRANK position.
- White ARM legend on ENG1(2)/START pushbutton switch comes on.
- LH and RH air conditioning packs close.

2 Press ENG1(2)/START pushbutton switch.
If APU is used, APU rating increases to 101.4% (40712 RPM).
- white ARM legend goes off.
- start valve opens.
- blue OPEN legend comes on.
- starter is engaged.

R (f)On panel 437VU

- check that starting air pressure is approximately 30 psi.

NOTE : If start valve fails to open automatically, it can be opened manually, respecting safety area access (Ref. 80-00-00, P. Block 201).

R (g)Motor engine with starter for 10-20 seconds and monitor oil pressure for increasing indication, N2 for rotation.

NOTE : Starter operating limits must be observed. (Ref. 80-11-00, P. Block 1)

R (h)Place ignition selector switch in OFF position.
- ENG1(2)/START pushbutton switch is released and OPEN legend goes off.
- air conditioning packs open.
- start valves close.

R (j)On panel 430VU
- release all FUEL/PUMPS pushbutton switches (OFF legend on). (when compressors stop rotating).

R (k)Stop pneumatic power supply to engine starting system and remove supplying tool as necessary.

R (l)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R (m)Inspect the oil and fuel system lines, fittings and accessories for leakage.

WARNING : A MINIMUM OF 5 MINUTES SHOULD ELAPSE AFTER ENGINE SHUTDOWN BEFORE REMOVING OIL TANK FILTER CAP TO ALLOW TANK PRESSURE TO BLEED OFF. HOT OIL GUSHING FROM TANK COULD CAUSE SEVERE BURNS.

R (n)Check oil level in oil tank, top up if necessary (Ref. 12-13-79, P. Block 1).

R (p)Remove the two Wedges (PWA102757) from the fan blade to fan case clearance gap.

R (q)Remove safety clips and tags and close circuit breakers 1JH, 2JH, 8JH, 3KC and 4KC.

(5)Wet motoring (N1 and N2 Rotation)

WARNING : MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROL SURFACES ARE CLEAR BEFORE MOTORING THE ENGINE. MOVEMENT OF THE FLIGHT CONTROL SURFACES CAN BE DANGEROUS AND/OR CAUSE DAMAGE.

CAUTION : MAKE SURE THAT THERE IS NO HYDRAULIC GROUND POWER SUPPLY CONNECTED TO THE AIRCRAFT WHEN YOU DO THIS PROCEDURE. IF A GROUND POWER SUPPLY IS CONNECTED, THERE IS A RISK OF DAMAGE TO THE ENGINE PUMPS.

CAUTION : ENGINE DRIVEN HYDRAULIC PUMPS ARE HYDRAULIC FLUID LUBRICATED. DO NOT MOTOR ENGINE UNLESS HYDRAULIC TANK PRESSURIZATION VALVE IS WITHIN NORMAL OPERATING RANGE.

CAUTION : OBSERVE ALL SAFETY PRECAUTIONS PRIOR TO WET MOTORING THE ENGINE. FUEL MIST EXHAUSTED BY THE ENGINE CREATES AN EXTREME FIRE HAZARD.

(a)Open, safety and tag circuit breakers 1JH, 2JH and 8JH and make certain that circuit breaker 1KG is closed.

(b)On panel 430VU
- press all FUEL/PUMPS pushbutton switches (OFF legend off)
- check on fuel page that supply is established.

(c)On panel 429VU

CAUTION : DURING WET MOTORING OPERATIONS, RESPECT STARTER UTILIZATION LIMITS (Ref. 80-11-00. P. Block 1).

1 Place ENG/IGNITION selector switch in CRANK position.
- White ARM legend comes on
- LH and RH air conditioning packs close.

2 Press ENG1(2)/START pushbutton switch
If APU is used, APU rating increases to N1 : 101.4 % (40712 RPM)
- white ARM legend goes off
- starter valve opens
- blue OPEN legend comes on
- starter is engaged.

(d)On panel 437VU
- check that starting air pressure is approximately 30 psi.

NOTE : If start valve fails to open automatically it can be opened manually, respecting safety area access (Ref. 80-00-00, P. Block 201).

CAUTION : ON THE ECAM SYSTEM, CHECK THAT OIL PRESSURE INDICATION ON ENG 1 (ENG 2) INDICATOR INCREASES. IF IT HAS NOT INCREASED

AFTER 30 SECONDS, DISCONTINUE MOTORING.

(e)When engine core speed (N2) reaches 15%, place ENG 1 (ENG 2) HP fuel shutt off valve control lever in ON position.

(f)Continue motoring until fuel vapor can be seen at exhaust nozzle (or 30 seconds maximum).

(g)Place HP fuel shut off valve control lever in OFF position and check that fuel flow drops to zero.

(h)Continue motoring for at least 30 seconds in order to evacuate fuel from combustion chamber.

NOTE : For initial start after wet motoring, a minimum of 5 minutes at MINIMUM IDLE is required.

R (j)Place ENG/IGNITION selector switch in OFF position.

R (k)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R (l)Inspect the oil and fuel system lines, fittings and accessories for leakage.

NOTE : It is normal to see fuel leakage thru P-flange (low turbine to exhaust case) during wet motoring with a cold engine.

WARNING : A MINIMUM OF 5 MINUTES SHOULD ELAPSE AFTER ENGINE SHUTDOWN BEFORE REMOVING OIL TANK FILTER CAP TO ALLOW TANK PRESSURE TO BLEED OFF. HOT OIL GUSHING FROM TANK COULD CAUSE SEVERE BURNS.

R (m)Check oil level in oil tank, top up if necessary (Ref. 12-13-79, P. Block 1).

R (n)On panel 430VU
- release all FUEL/PUMPS pushbutton switches (OFF legend on)

R (p)Remove safety clips and tags and close circuit breakers 1JH, 2JH and 8JH.

(6)Wet motoring (Optional - No N1 Rotation)

WARNING : MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROL SURFACES ARE CLEAR BEFORE MOTORING THE ENGINE. MOVEMENT OF THE FLIGHT CONTROL SURFACES CAN BE DANGEROUS AND/OR CAUSE DAMAGE.

CAUTION : MAKE SURE THAT THERE IS NO HYDRAULIC GROUND POWER SUPPLY CONNECTED TO THE AIRCRAFT WHEN YOU DO THIS PROCEDURE. IF A GROUND POWER SUPPLY IS CONNECTED, THERE IS A RISK OF DAMAGE TO THE ENGINE PUMPS.

CAUTION : ENGINE DRIVEN HYDRAULIC PUMPS ARE HYDRAULIC FLUID LUBRICATED. DO NOT MOTOR ENGINE UNLESS HYDRAULIC TANK PRESSURIZATION VALVE IS WITHIN NORMAL OPERATING RANGE.

CAUTION : OBSERVE ALL SAFETY PRECAUTIONS PRIOR TO WET MOTORING THE ENGINE. FUEL MIST EXHAUSTED BY THE ENGINE CREATES AN EXTREME FIRE HAZARD.

(a)Carefully install two PWA 102757 Wedges between two fan blades and the fan case at approximately the 6 o'clock position. The thinnest edge of the wedge must be centered onto the leading edge of the fan blades and then tapped into position, along the blade chord line, until they fit tightly in the fan blade to case clearance gap (Ref. Fig. 522).

(b)Open, safety and tag circuit breakers 1JH, 2JH and 8JH and make certain that circuit breaker 1KG is closed.

(c)On panel 430VU
- press all FUEL/PUMPS pushbutton switches (OFF legend off)
- check on fuel page that supply is established.

(d)On panel 429VU

CAUTION : DURING WET MOTORING OPERATIONS, RESPECT STARTER UTILIZATION LIMITS (Ref. 80-11-00. P. Block 1).

1 Place ENG/IGNITION selector switch in CRANK position.
- White ARM legend comes on
- LH and RH air conditioning packs close.

2 Press ENG1(2)/START pushbutton switch
If APU is used, APU rating increases to N1 : 101.4 % (40712 RPM)
- white ARM legend goes off
- starter valve opens
- blue OPEN legend comes on
- starter is engaged.

(e)On panel 437VU
- check that starting air pressure is approximately 30 psi.

NOTE : If start valve fails to open automatically it can be opened manually, respecting safety area access (Ref. 80-00-00, P. Block 201).

CAUTION : ON THE ECAM SYSTEM, CHECK THAT OIL PRESSURE INDICATION ON ENG 1 (ENG 2) INDICATOR INCREASES. IF IT HAS NOT INCREASED AFTER 30 SECONDS, DISCONTINUE MOTORING.

(f)When engine core speed (N2) reaches 15%, place ENG 1 (ENG 2) HP fuel shutt off valve control lever in ON position.

(g)Continue motoring until fuel vapor can be seen at exhaust nozzle (or 30 seconds maximum).

(h)Place HP fuel shut off valve control lever in OFF position and check that fuel flow drops to zero.

R (j)Continue motoring for at least 30 seconds in order to evacuate fuel from combustion chamber.

NOTE : For initial start after wet motoring, a minimum of 5 minutes at MINIMUM IDLE is required.

R (k)Place ENG/IGNITION selector switch in OFF position.

R (l)Stop pneumatic power supply to engine starting system and remove supplying tool as necessary.

R (m)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R (n)Inspect the oil and fuel system lines, fittings and accessories for leakage.

NOTE : It is normal to see fuel leakage thru P-flange (low turbine to exhaust case) during wet motoring with a cold engine.

WARNING : A MINIMUM OF 5 MINUTES SHOULD ELAPSE AFTER ENGINE SHUTDOWN BEFORE REMOVING OIL TANK FILTER CAP TO ALLOW TANK PRESSURE TO BLEED OFF. HOT OIL GUSHING FROM TANK COULD CAUSE SEVERE BURNS.

R (p)Check oil level in oil tank, top up if necessary (Ref. 12-13-79, P. Block 1).

R (q)Remove the two Wedges (PWA102757) from the fan blade to fan case clearance gap.

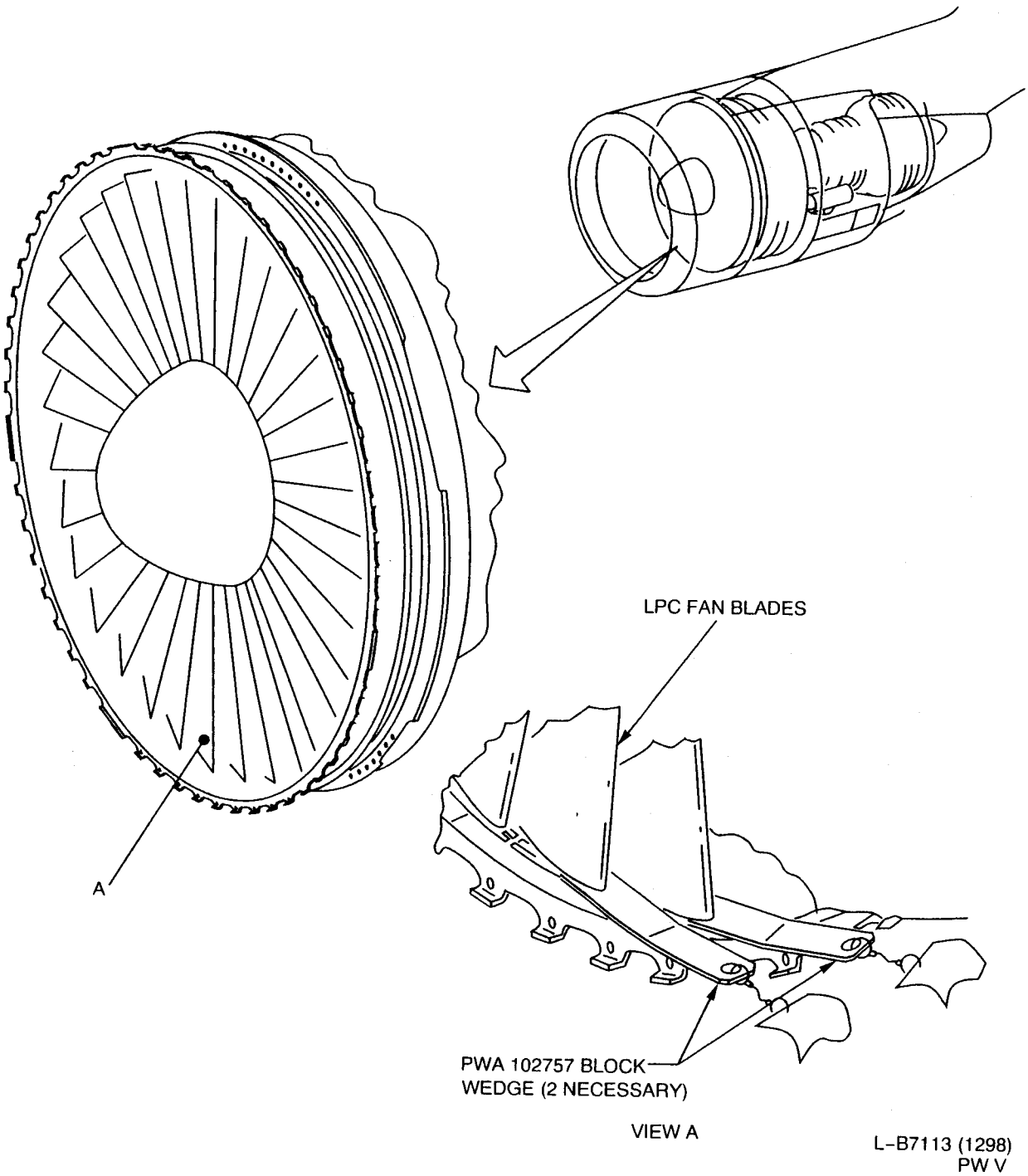
R (r)On panel 430VU
- release all FUEL/PUMPS pushbutton switches (OFF legend on)

R (s)Remove safety clips and tags and close circuit breakers 1JH, 2JH and 8JH.

(7)Close-up

NOTE : Job close-up is similar for :
- Dry motoring
- Wet motoring

(a)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(b)Shut down APU (Ref. 49-00-00, P. Block 501).
(c)Remove ground interphone equipment.
(d)For extended inactive periods after the engine is sufficiently cooled, install inlet and exhaust covers.
(e)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).



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Installation of PWA102757 Block Wedges
Figure 522

R K. Test No. 3 - Ground Test - Idle Power

(1)General

This test also pressurizes various systems at idle power to permit a thorough leak check of components replaced.

(2)Procedure (cowl doors closed)

WARNING : BEFORE STARTING ONE OR BOTH ENGINES ALL SAFETY AND OPERATING PRECAUTIONS MUST BE OBSERVED TO IMMOBILIZE AIRCRAFT (REF. 2.E.).

(a)Prepare, service and start engine as described in 71-00-00, P. Block 201.

(b)Allow N2 to stabilize at MINIMUM IDLE for 5 minutes.

(c)On right ECAM display unit (ENG page), check that operating indications are within the operating limits (Ref. 71-00-00, P. Block 201).
Check N1 vibration indication (Ref. 71-00-00, P. Block 201).
Check N2 vibration indication (Ref. 71-00-00, P. Block 201).

(d)Select HYDRAULIC page by pressing HYD pushbutton switch on ECAM Control Panel and check that indications are around 3000 psi ± 200 psi.

(e)Select AIR BLEED page by pressing BLEED pushbutton switch on ECAM Control Panel and check that indication is about 30 psi.

(f)When above operating conditions are met, record N1, N2, EGT Oil Pressure and Oil Temperature.

NOTE : Guidelines for expected performance levels are provided in "Typical Operating Ranges" Table.

(g)Shut down engine as described for normal operation (Ref. 71-00-00, P. Block 201).

(h)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
Inspect for leaks. Repair as necessary.

NOTE : During visual inspection of oil tubes for condition, security and leakage, very small amount of oil wetness might be observed on variable vane arm retention bolts near the bottom of the engine, or in the nose cone/spinner. The source of this oil is either the No. 1 Bearing Carbon Seal Assembly or the No. 2 Bearing Carbon Seal Assembly.
It is normal, especially following engine windmilling or an extended start sequence, that a small amount of oil would seep past the Bearing Carbon Seal Assemblies and then accumulate, after engine shutdown, on the variable vane arm retention bolts. This amount of oil seepage is an acceptable and normal condition and is not cause to remove the engine from service as long as other inspection criteria for oil leaks from engine oil tubes are met.

R (j)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R (k)Retest as necessary.

(3)Test procedure (cowl doors open) :

WARNING : FOR ENGINE RUN-UP WITH THRUST REVERSER COWL DOORS OPEN, THE FOLLOWING CONDITIONS MUST BE STRICTLY APPLIED :
- GROUND IDLE MUST NOT BE EXCEEDED.

- THRUST REVERSER COWL DOORS MUST BE CORRECTLY SECURED IN OPEN POSITION WITH TOOL RSE1193.

MAINTENANCE PROCEDURE ON ENGINE MUST BE REDUCED TO TEST NO. 3, AND PERFORMED ONLY WHEN AUTHORIZED BY THE MAN IN CHARGE OF ENGINE CONTROL.

(a)Prepare and service engine for normal operation (Ref. 71-00-00, P. Block 201).

(b)Open, safety and tag thrust reverser circuit breakers and open fan thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(c)Disconnect thrust reverser door hydraulic pump leaving system pressurized.

(d)Install idle leak test safety support (RSE-1131 or RSE-1193) on thrust reverser cowl doors (Ref. Fig. 523).

CAUTION : THE FOUR THRUST REVERSER COWL HOLD OPEN RODS MUST BE IN POSITION AND SECURED.

NOTE : Looking forward, the RSE-1131 or RSE-1193 Support is installed between the forward latch of the left thrust reverser door and the forward keeper of the right thrust reverser door, when both thrust reverser doors are in the 40 degrees open position.

- Install support as follows :
  - At left side, engage latch of the thrust reverser door with the keeper of the support beam. Pull down door latch handle to secure left support beam firmly to thrust reverser door.
  - At right side, engage latch of the right support beam with the keeper of the thrust reverser door.
  - Place the right support beam into the U section of the left support beam.
  - Push up the support beam latch handle to secure the right support beam firmly to the thrust reverser door.
  - Insert quick release pin through hole in U section and right support beam.

(e)Start engine using normal starting procedure.

CAUTION : GROUND IDLE (MINIMUM IDLE) POWER MUST NOT BE EXCEEDED DURING COWL DOORS OPEN OPERATION.
IF GROUND IDLE CONDITIONS CAN NOT BE MAINTAINED DURING LEAK TEST, SHUT DOWN ENGINE IMMEDIATELY.

(f)Allow engine conditions to stabilize at ground idle (minimum idle).

WARNING : DO NOT ENTER FAN STREAM AREA. REFER TO PARAGRAPH 3. FOR DEFINITION AND LOCATION OF HAZARD AREAS.

(g)On right ECAM display unit (ENG page), check that operating indications are within the operating limits (Ref. 71-00-00, P. Block 201).
Check N1 vibration indication (Ref. 71-00-00, P. Block 201).
Check N2 vibration indication (Ref. 71-00-00, P. Block 201).

(h)Select HYDRAULIC page by pressing HYD pushbutton switch on ECAM control Panel and check that indications are around 3000 psi ± 250 psi.

R (j)Select AIR BLEED page by pressing BLEED pushbutton switch on ECAM control Panel and check that indication is about 30 psi.

R (k)When above operating conditions are met, record N1, N2, EGT Oil Pressure and Oil Temperature.

NOTE : Guidelines for expected performance levels are provided in "Typical Operating Ranges" Table.

R (l)Approach engine with caution and inspect for leaks.
R (m)Shut down engine as described by normal operating procedure (Ref. 71-00-00, P. Block 201).
R (n)Repair leaks as necessary.
R (p)Retest as necessary.
R (q)Remove idle leaks test safety support (RSE-1131 or RSE-1193) from thrust reverser cowl doors (Ref. Fig. 523).
R (r)Connect thrust reverser door hydraulic pump.
R (s)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301), remove safety clips and tags and close thrust reverser circuit breakers.

R L. Test No. 3A - Idle Leak Check

(1)General

This test also pressurizes various systems at idle power to permit a thorough leak check of components replaced.

(2)Procedure (cowl doors closed)

WARNING : BEFORE STARTING ONE OR BOTH ENGINES ALL SAFETY AND OPERATING PRECAUTIONS MUST BE OBSERVED TO IMMOBILIZE AIRCRAFT (REF. 2.E.).

(a)Prepare, service and start engine as described in 71-00-00, P. Block 201.

(b)Allow N2 to stabilize at MINIMUM IDLE for 5 minutes.

(c)Verify that operating indications are within operating limits.

(d)Shut down engine as described for normal operation (Ref. 71-00-00, P. Block 201).

(e)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Inspect for leaks. Repair as necessary.

(f)NOTE : During visual inspection of oil tubes for condition, security and leakage, very small amount of oil wetness might be observed on variable vane arm retention bolts near the bottom of the engine, or in the nose cone/spinner. The source of this oil is either the No. 1 Bearing Carbon Seal Assembly or the No. 2 Bearing Carbon Seal Assembly.
It is normal, especially following engine windmilling or an extended start sequence, that a small amount of oil would seep past the Bearing Carbon Seal Assemblies and then accumulate, after engine shutdown, on the variable vane arm retention bolts. This amount of oil seepage is an acceptable and normal condition and is not cause to remove the engine from service as long as other inspection criteria for oil leaks from engine oil tubes are met.

(g)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(h)Retest as necessary.

(3)Test procedure (cowl doors open) :

WARNING : FOR ENGINE RUN-UP WITH THRUST REVERSER COWL DOORS OPEN, THE FOLLOWING CONDITIONS MUST BE STRICTLY APPLIED :
- GROUND IDLE MUST NOT BE EXCEEDED.
- THRUST REVERSER COWL DOORS MUST BE CORRECTLY SECURED IN OPEN POSITION WITH TOOL RSE1193.

MAINTENANCE PROCEDURE ON ENGINE MUST BE REDUCED TO TEST NO. 3, AND PERFORMED ONLY WHEN AUTHORIZED BY THE MAN IN CHARGE OF ENGINE CONTROL.

(a)Prepare and service engine for normal operation (Ref. 71-00-00, P. Block 201).

(b)Open, safety and tag thrust reverser circuit breakers and open fan thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(c)Disconnect thrust reverser door hydraulic pump leaving system pressurized.

(d)Install idle leak test safety support (RSE-1131 or RSE-1193) on thrust reverser cowl doors.

CAUTION : THE FOUR THRUST REVERSER COWL HOLD OPEN RODS MUST BE IN POSITION AND SECURED.

NOTE : Looking forward, the RSE-1131 or RSE-1193 Support is installed between the forward latch of the left thrust reverser door and the forward keeper of the right thrust reverser door, when both thrust reverser doors are in the 40 degrees open position.

- Install support as follows :
  - At left side, engage latch of the thrust reverser door with the keeper of the support beam. Pull down door latch handle to secure left support beam firmly to thrust reverser door.
  - At right side, engage latch of the right support beam with the keeper of the thrust reverser door.
  - Place the right support beam into the U section of the left support beam.
  - Push up the support beam latch handle to secure the right support beam firmly to the thrust reverser door.
  - Insert quick release pin through hole in U section and right support beam.

(e)Start engine using normal starting procedure (Ref. 71-00-00, P. Block 201).

CAUTION : GROUND IDLE (MINIMUM IDLE) POWER MUST NOT BE EXCEEDED DURING COWL DOORS OPEN OPERATION.
IF GROUND IDLE CONDITIONS CAN NOT BE MAINTAINED DURING LEAK TEST, SHUT DOWN ENGINE IMMEDIATELY.

(f)Allow engine conditions to stabilize at ground idle (minimum idle).

WARNING : DO NOT ENTER FAN STREAM AREA. REFER TO PARAGRAPH 3. FOR DEFINITION AND LOCATION OF HAZARD AREAS.

(g)Approach engine with caution and inspect for leaks.

(h)Shut down engine as described by normal operating procedure (Ref. 71-00-00, P. Block 201).

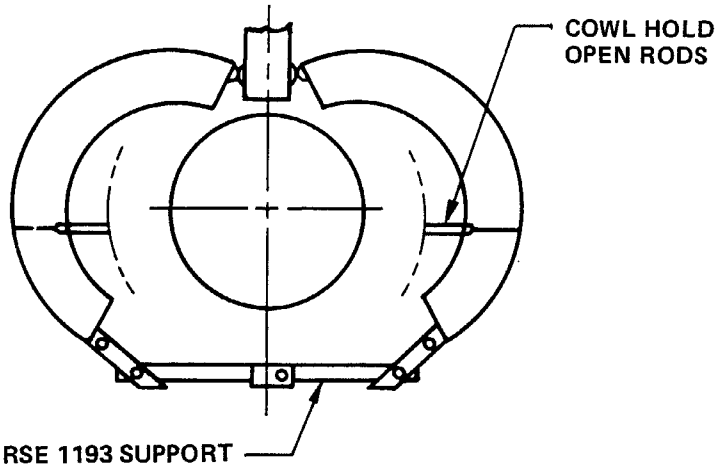
R (j)Repair leaks as necessary.

R (k)Retest as necessary.

R (l)Remove idle leaks test safety support (RSE-1131 or RSE-1193) from thrust reverser cowl doors.

R (m)Connect thrust reverser door hydraulic pump.

R (n)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301), remove safety clips and tags and close thrust reverser circuit breakers.



NOTE: IN THE 40 DEGREE OPEN POSITION OF THE THRUST REVERSER DOORS THE SUPPORT TOOL ATTACHED BETWEEN THE LOWER FORWARD LATCH AND KEEPER PREVENTS THE ACCIDENTAL CLOSURE OF THE THRUST REVERSER DOORS.

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Installation of RSE1193 Support - Schematic - Front View
Figure 523

R M. Test No. 4 - Power Acceleration/Deceleration Test

(1)Reason for the test

(a)Use the power acceleration/deceleration test to check for the correct engine acceleration and deceleration operation in the permitted time limits.

(2)Equipment and materials

ITEM	DESIGNATION
(a)	Stop Watch (Optional to Aircraft Clock)
Referenced Procedures - 71-00-00, P. Block 201	Power Plant - General

(3)Safety Conditions

WARNING : BEFORE STARTING ONE OR BOTH ENGINES ALL SAFETY AND OPERATING PRECAUTIONS MUST BE OBSERVED TO IMMOBILIZE AIRCRAFT (Ref. 2.E.).

R (a)Obey the safety and operating precautions as described in Paragraph 2.
R (Ref. 71-00-00, P. Block 501).
R (b)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.
R (c)There must be two qualified persons in the cockpit when performing
R an engine run above idle. One must monitor the outside and the
R aircraft behaviour while the other performs the engine test.
R (d)If the aircraft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.
R (e)Make sure the aircraft is pointed into the wind during the snap acceleration and deceleration test.
R (f)For engine operating limits, refer to 71-00-00, P. Block 201.
R (g)The limits for this test are calculated for no engine bleed air and no gearbox accessory loads. Operate the test engine with the ECS bleeds OFF, the wing anti-ice OFF and the engine anti-ice OFF (except as noted below). The test engine must use no (or minimum) electrical generator loads and hydraulic pump loads.

CAUTION : DO NOT OPERATE THE ENGINE WITHOUT THE ANTI-ICE SYSTEM IF YOU CAN SEE MOISTURE IN THE AIR AND THE AIR TEMPERATURE IS 8 DEGREES C OR LESS. IT IS POSSIBLE TO MAKE ICE IN THE ENGINE INLET AREA AND CAUSE DAMAGE WITH THESE CONDITIONS, IF THE ANTI-ICE SYSTEM IS OFF.

R (h)Moisture in the air that you can see is when there is rain, sleet, ice crystals or snow, or the visibility is less than 1600 m (1 mile) because of fog.
R (j)It is recommended that this test be done with anti-ice system OFF but if it is necessary to use the anti-ice system (because of weather conditions) operate the engine as follows :

1 Turn the anti-ice system OFF 30 seconds before you check the MIN IDLE engine parameters.
2 Turn the anti-ice system ON after you have checked the MIN IDLE engine parameters.
3 Turn the anti-ice system OFF 30 seconds before you record the thrust

lever position at the 1.30 EPR target value.
4 Turn the anti-ice system ON after you record the thrust lever position at the 1.30 EPR target value.
5 Turn the anti-ice system OFF 30 seconds before you do the timed snap acceleration and snap deceleration steps of this test.
6 Turn the anti-ice system ON after you do the timed snap acceleration and snap deceleration steps of this test.

R (k)Monitor the wind direction during the test and obey the cross wind limits to prevent inlet vortex ingestion. (Ref. to Para. 2.F.).

R (l)Calculate the target power settings as follows :
1 Get and record the ambient air temperature (outside air temperature) with a thermometer.
Measure the temperature adjacent to the aircraft in the shade.
2 Get and record the airport altitude form the control tower.
3 Calculate the MIN IDLE parameters. Use the record of the ambient air temperature that you made before. See the Minimum Idle Power Assurance Table (Ref. Fig. 524).
- You will check the MIN IDLE parameters during the beginning of the snap acceleration and deceleration test.
4 Calculate the Flight Idle (%) N2 speed. Use the record of the ambient air temperature and the airport altitude that you made before. See the Flight Idle Table (Ref. Fig. 525) (and Ref. Table 503A).
- You will set Flight Idle (%) N2 speed during the snap acceleration and deceleration test.

R (m)Do the snap acceleration and deceleration test with the engine control in the primary EPR mode.

(4)Acceleration/deceleration test procedure
(a)Start both engines (Ref. 71-00-00, P. Block 201).
(b)Let both engines become stable for 5 minutes at MIN IDLE.
(c)Check that both engines are within the limits for MIN IDLE. You calculated these values before (Ref. Fig. 524).
(d)Slowly advance the thrust lever for both engines to 1.10 EPR (approximately 60 - 65 % N1).
1 This power setting is necessary for aircraft thrust balance.
(e)Continue to slowly advance the thrust lever for the engine that will be tested for acceleration and deceleration to 1.30 EPR.
(f)Let the test engine become stable at 1.30 EPR for 60 seconds.
(g)Record the position of the test engine thrust lever at 1.30 EPR. You will need this position later.
(h)Slowly move the thrust levers for both engines to MIN IDLE.

R (j)Get the record of the Flight Idle (%) N2 speed that you calculated before (Ref. Fig. 525) (and Ref. Table 503A).

R (k)Slowly advance the thrust lever for the test engine to Flight Idle (%) N2 speed.

R (l)Let the test engine become thermally stable at Flight Idle for 15 minutes before you go to the next step.
1 The test engine must be thermally stable at this power setting before you do the snap acceleration and deceleration test.

R (m)Slowly advance the thrust lever for the engine that will not be tested to 1.10 EPR.

R (n)Prepare to time the snap acceleration with a stop watch or the aircraft

clock.

CAUTION : IF THE ENGINE DOES A SURGE DURING THE SNAP ACCELERATION AND DECELERATION TEST, QUICKLY MOVE THE THROTTLE TO MIN IDLE WITHIN ONE SECOND OF THE SURGE. IF THERE IS NOT EGT OVERTEMPERATURE AND THE EGT IS NOT INCREASING, OPERATE THE ENGINE AT MIN IDLE FOR 5 MINUTES BEFORE ENGINE SHUTDOWN. IF THERE IS EGT OVERTEMPERATURE, DO A EMERGENCY ENGINE SHUTDOWN AND MOTOR THE ENGINE WITH THE STARTER UNTIL THE EGT IS LESS THAN 180 DEGREES C.

CAUTION : DO NOT ENGAGE THE ENGINE STARTER AT N2 SPEEDS MORE THAN 15 % N2 TO PREVENT DAMAGE TO THE STARTER.

NOTE : If the engine is shutdown after a surge, do the Engine Start Procedure Following Emergency Shutdown (Ref. 71-00-00, P. Block 201). This procedure will prevent damage to the turbine blade tip seals.

R (p) Quickly advance the thrust lever of the test engine in one second or less from Flight Idle (%) N2 speed to the 1.30 EPR target position that you recorded before.

R (q) Measure the acceleration time with the stop watch (or aircraft clock) from when you first advance the thrust lever to when the engine gets to 1.27 EPR.

R (r) The acceleration time limit is : Must be less than 8 seconds.

R (s) Let the test engine become stable at 1.30 EPR for 60 seconds.

R (t) Prepare to time the snap deceleration with a stop watch or the aircraft clock.

R (u) Quickly move the thrust lever of the test engine in one second or less from 1.30 EPR to MIN IDLE.

R (v) Measure the acceleration time with the stop watch (or aircraft clock) from when you first move the thrust lever from 1.30 EPR to when the engine gets to 1.08 EPR.

R (w) The deceleration time limit is : Must be less than 7 seconds.

R (x) Slowly move the thrust lever for the engine that was not tested to MIN IDLE.

R (y) If the other engine is to be tested for acceleration and deceleration, do steps E. (2) through (22) again.

R (aa) Let both engine become stable for 5 minutes minimum at MIN IDLE.

R (ab) Do a normal engine shutdown for both engines (Ref. 71-00-00, P. Block 201).

TAT	EPR		% N1		% N2		EGT C		Wf, KG/HR	
C	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
-25	1.004	1.034	22.8	27.8	57.7	61.1	206	315	447	780
-24	1.003	1.033	22.7	27.7	57.7	61.1	208	317	445	774
-23	1.003	1.033	22.5	27.5	57.7	61.1	210	319	443	768
-22	1.003	1.033	22.4	27.4	57.7	61.1	212	321	442	762
-21	1.002	1.032	22.2	27.2	57.7	61.1	214	323	440	756
-20	1.002	1.032	22.1	27.1	57.7	61.1	216	325	439	749
-19	1.001	1.031	22.0	27.0	57.7	61.1	218	327	438	744
-18	1.001	1.031	21.9	26.9	57.7	61.1	220	329	436	738
-17	1.000	1.030	21.6	26.6	57.7	61.1	223	332	435	732
-16	1.000	1.030	21.5	26.5	57.7	61.1	225	334	434	726
-15	1.000	1.030	21.4	26.4	57.7	61.1	227	336	432	722
-14	0.999	1.029	21.2	26.2	57.7	61.1	229	338	431	717
-13	0.999	1.029	21.1	26.1	57.7	61.1	231	340	430	712
-12	0.999	1.029	21.0	26.0	57.7	61.1	233	342	428	707
-11	0.998	1.028	20.7	25.7	57.7	61.1	236	345	427	702
-10	0.998	1.028	20.6	25.6	57.7	61.1	238	347	426	698
-9	0.998	1.028	20.5	25.5	57.7	61.1	240	349	424	694
-8	0.997	1.027	20.4	25.4	57.7	61.1	243	352	423	689
-7	0.997	1.027	20.3	25.3	57.7	61.1	245	354	422	685
-6	0.997	1.027	20.1	25.1	57.7	61.1	247	356	420	681
-5	0.997	1.027	20.0	25.0	57.7	61.1	250	359	419	677
-4	0.996	1.026	19.9	24.9	57.7	61.1	252	361	418	673
-3	0.996	1.026	19.7	24.7	57.7	61.1	254	363	416	669
-2	0.996	1.026	19.6	24.6	57.7	61.1	257	366	415	665
-1	0.995	1.025	19.5	24.5	57.7	61.1	259	368	414	661
0	0.995	1.025	19.4	24.4	57.7	61.1	262	371	412	658
1	0.995	1.025	19.3	24.3	57.7	61.1	264	373	411	654
2	0.995	1.025	19.2	24.2	57.7	61.1	266	375	410	653
3	0.995	1.025	19.3	24.3	57.7	61.1	268	377	411	654
4	0.995	1.025	19.3	24.3	57.7	61.1	270	379	412	655
5	0.995	1.025	19.3	24.3	58.1	61.5	272	381	413	655
6	0.995	1.025	19.4	24.4	58.2	61.6	275	384	414	656
7	0.995	1.025	19.4	24.4	58.3	61.7	277	386	415	657
8	0.995	1.025	19.5	24.5	58.5	61.9	279	388	416	658
9	0.995	1.025	19.5	24.5	58.6	62.0	281	390	417	659
10	0.995	1.025	19.5	24.5	58.6	62.0	283	392	419	659
11	0.995	1.025	19.5	24.5	58.7	62.1	285	394	420	660
12	0.995	1.025	19.6	24.6	58.7	62.1	287	396	421	661
13	0.995	1.025	19.6	24.6	59.0	62.4	289	398	422	662
14	0.995	1.025	19.7	24.7	59.1	62.5	291	400	423	663
15	0.995	1.025	19.7	24.7	59.2	62.6	293	402	424	663
16	0.995	1.025	19.8	24.8	59.3	62.7	295	404	425	664

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Minimum Idle Power Assurance Table
(Sheet 1/2)
Figure 524

TAT	EPR		% N1		% N2		EGT C		Wf, KG/HR	
C	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
17	0.995	1.025	19.8	24.8	59.5	62.9	297	406	426	665
18	0.995	1.025	19.8	24.8	59.6	63.0	300	409	427	666
19	0.995	1.025	19.9	24.9	59.6	63.0	302	411	428	666
20	0.995	1.025	19.9	24.9	59.7	63.1	304	413	429	667
21	0.995	1.025	19.9	24.9	59.9	63.3	306	415	431	668
22	0.995	1.025	20.0	25.0	60.0	63.4	308	417	432	669
23	0.995	1.025	20.0	25.0	60.1	63.5	310	419	433	669
24	0.995	1.025	20.0	25.0	60.2	63.6	312	421	434	670
25	0.995	1.025	20.1	25.1	60.3	63.7	314	423	435	671
26	0.995	1.025	20.1	25.1	60.4	63.8	316	425	436	672
27	0.995	1.025	20.1	25.1	60.5	63.9	318	427	437	672
28	0.995	1.025	20.2	25.2	60.6	64.0	320	429	438	673
29	0.995	1.025	20.2	25.2	60.7	64.1	322	431	439	673
30	0.995	1.025	20.2	25.2	61.0	64.4	324	433	440	674
31	0.995	1.025	20.3	25.3	61.4	64.8	326	435	441	675
32	0.995	1.025	20.3	25.3	61.6	65.0	328	437	442	676
33	0.995	1.025	20.3	25.3	62.0	65.4	330	439	443	677
34	0.995	1.025	20.4	25.4	62.2	65.6	332	441	445	677
35	0.995	1.025	20.4	25.4	62.4	65.8	334	443	446	678
36	0.995	1.025	20.4	25.4	62.5	65.9	336	445	447	679
37	0.995	1.025	20.5	25.5	62.6	66.0	338	447	448	680
38	0.995	1.025	20.5	25.5	62.7	66.1	340	449	449	681
39	0.995	1.025	20.5	25.5	62.8	66.2	342	451	450	681
40	0.995	1.025	20.5	25.5	62.9	66.3	345	454	451	682
41	0.995	1.025	20.6	25.6	63.0	66.4	347	456	452	683
42	0.995	1.025	20.6	25.6	63.2	66.6	349	458	453	684
43	0.995	1.025	20.7	25.7	63.3	66.7	351	460	454	684
44	0.995	1.025	20.7	25.7	63.4	66.8	353	462	455	685
45	0.995	1.025	20.8	25.8	63.5	66.9	355	464	456	686
46	0.995	1.025	20.8	25.8	63.6	67.0	357	466	457	687
47	0.995	1.025	20.8	25.8	63.7	67.1	359	468	458	688
48	0.995	1.025	20.9	25.9	63.8	67.2	361	470	459	688
49	0.995	1.025	20.9	25.9	63.9	67.3	363	472	460	689
50	0.995	1.025	20.9	25.9	64.0	67.4	365	474	461	690

NOTE 1: THE TOLERANCES SHOWN ABOVE ARE FOR THE DIFFERENCES THAT FOLLOW:
- THE DIFFERENCE IN PERFORMANCE BETWEEN ONE ENGINE AND OTHER ENGINES.
- ENGINE PERFORMANCE DETERIORATION (CAUSED BY WORN PARTS).
- HUMIDITY IN THE AIR.

NOTE 2: THESE GROUND IDLE TABLES ARE SATISFACTORY FOR SEA LEVEL OPERATION TO 10000 FT (3048.00 M) FOR ALL PARAMETERS EXCEPT FUEL FLOW (Wf).
- FOR EACH 1000 FT (304.80 M) INCREASE IN ALTITUDE ABOVE SEA LEVEL, SUBTRACT 31 KG/HR FROM THE VALUES SHOWN IN THE TABLES.

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BM5 71 00 00 5 KWMJ 00

Minimum Idle Power Assurance Table
(Sheet 2/2)
Figure 524

NON-RING CASE COMPRESSOR (RCC) ENGINES
IDENTIFIED WITH EPP PN'S 51DXXX SERIES

ALTITUDE FT (M)	0	1000 (304.8)	2000 (609.6)	3000 (914.4)	4000 (1219.2)	5000 (1524.0)	6000 (1828.8)	7000 (2133.6)	8000 (2438.4)	9000 (2743.2)	10000 (3048.0)
TAT (C)	% N2										
-25	62.8	63.5	64.1	64.8	65.4	66.1	66.6	67.0	67.5	68.0	68.4
-24	62.9	63.6	64.2	64.9	65.6	66.2	66.7	67.2	67.6	68.1	68.6
-23	63.1	63.7	64.4	65.0	65.7	66.4	66.8	67.3	67.8	68.2	68.7
-22	63.2	63.8	64.5	65.2	65.8	66.5	67.0	67.4	67.9	68.4	68.8
-21	63.3	64.0	64.6	65.3	66.0	66.6	67.1	67.6	68.0	68.5	69.0
-20	63.4	64.1	64.8	65.4	66.1	66.7	67.2	67.7	68.2	68.6	69.1
-19	63.6	64.2	64.9	65.6	66.2	66.9	67.4	67.8	68.3	68.8	69.3
-18	63.7	64.3	65.0	65.7	66.3	67.0	67.5	68.0	68.4	68.9	69.4
-17	63.8	64.5	65.1	65.8	66.5	67.1	67.6	68.1	68.6	69.0	69.5
-16	63.9	64.6	65.3	65.9	66.6	67.3	67.7	68.2	68.7	69.2	69.7
-15	64.1	64.7	65.4	66.1	66.7	67.4	67.9	68.4	68.8	69.3	69.8
-14	64.2	64.9	65.5	66.2	66.9	67.5	68.0	68.5	69.0	69.4	69.9
-13	64.3	65.0	65.6	66.3	67.0	67.7	68.1	68.6	69.1	69.6	70.1
-12	64.4	65.1	65.8	66.4	67.1	67.8	68.3	68.8	69.2	69.7	70.2
-11	64.6	65.2	65.9	66.6	67.2	67.9	68.4	68.9	69.4	69.9	70.3
-10	64.7	65.4	66.0	66.7	67.4	68.1	68.5	69.0	69.5	70.0	70.5
-9	64.8	65.5	66.2	66.8	67.5	68.2	68.7	69.1	69.6	70.1	70.6
-8	64.9	65.6	66.3	67.0	67.6	68.3	68.8	69.3	69.8	70.2	70.7
-7	65.0	65.7	66.4	67.1	67.8	68.4	68.9	69.4	69.9	70.4	70.9
-6	65.2	65.8	66.5	67.2	67.9	68.6	69.1	69.5	70.0	70.5	71.0
-5	65.3	66.0	66.7	67.3	68.0	68.7	69.2	69.7	70.2	70.6	71.1
-4	65.4	66.1	66.8	67.5	68.1	68.8	69.3	69.8	70.3	70.8	71.3
-3	65.5	66.2	66.9	67.6	68.3	69.0	69.4	69.9	70.4	70.9	71.4
-2	65.7	66.3	67.0	67.7	68.4	69.1	69.6	70.1	70.5	71.0	71.5
-1	65.8	66.5	67.1	67.8	68.5	69.2	69.7	70.2	70.7	71.2	71.7
0	65.9	66.6	67.3	68.0	68.6	69.3	69.8	70.3	70.8	71.3	71.8
1	66.0	66.7	67.4	68.1	68.8	69.5	70.0	70.4	70.9	71.4	71.9
2	66.1	66.8	67.5	68.2	68.9	69.6	70.1	70.6	71.1	71.6	72.1
3	66.3	66.9	67.6	68.3	69.0	69.7	70.2	70.7	71.2	71.7	72.2
4	66.4	67.1	67.8	68.5	69.1	69.8	70.3	70.8	71.3	71.8	72.3
5	66.5	67.2	67.9	68.6	69.3	70.0	70.5	71.0	71.5	72.0	72.4
6	66.6	67.3	68.0	68.7	69.4	70.1	70.6	71.1	71.6	72.1	72.6
7	66.7	67.4	68.1	68.8	69.5	70.2	70.7	71.2	71.7	72.2	72.7
8	66.8	67.5	68.2	68.9	69.6	70.3	70.8	71.3	71.8	72.3	72.8
9	67.0	67.7	68.4	69.1	69.8	70.5	71.0	71.5	72.0	72.5	73.0
10	67.1	67.8	68.5	69.2	69.9	70.6	71.1	71.6	72.1	72.6	73.1
11	67.2	67.9	68.6	69.3	70.0	70.7	71.2	71.7	72.2	72.7	73.2
12	67.3	68.0	68.7	69.4	70.1	70.8	71.3	71.8	72.3	72.9	73.4
13	67.4	68.1	68.9	69.6	70.3	71.0	71.5	72.0	72.5	73.0	73.5
14	67.6	68.3	69.0	69.7	70.4	71.1	71.6	72.1	72.6	73.1	73.6
15	67.7	68.4	69.1	69.8	70.5	71.2	71.7	72.2	72.7	73.2	73.7
16	67.8	68.5	69.2	69.9	70.6	71.3	71.8	72.3	72.9	73.4	73.9

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Flight Idle N2 Table (Sheet 1/2)
Figure 525

NON-RING CASE COMPRESSOR (RCC) ENGINES
IDENTIFIED WITH EPP PN'S 51DXXX SERIES

ALTITUDE FT (M)	0	1000 (304.8)	2000 (609.6)	3000 (914.4)	4000 (1219.2)	5000 (1524.0)	6000 (1828.8)	7000 (2133.6)	8000 (2438.4)	9000 (2743.2)	10000 (3048.0)
TAT (C)	% N2										
17	67.9	68.6	69.3	70.0	70.7	71.5	72.0	72.5	73.0	73.5	74.0
18	68.0	68.7	69.4	70.2	70.9	71.6	72.1	72.6	73.1	73.6	74.1
19	68.1	68.9	69.6	70.3	71.0	71.7	72.2	72.7	73.2	73.7	74.2
20	68.3	69.0	69.7	70.4	71.1	71.8	72.3	72.8	73.4	73.9	74.4
21	68.4	69.1	69.8	70.5	71.2	71.9	72.5	73.0	73.5	74.0	74.5
22	68.5	69.2	69.9	70.6	71.4	72.1	72.6	73.1	73.6	74.1	74.6
23	68.6	69.3	70.0	70.8	71.5	72.2	72.7	73.2	73.7	74.2	74.8
24	68.7	69.4	70.2	70.9	71.6	72.3	72.8	73.3	73.9	74.4	74.9
25	68.8	69.6	70.3	71.0	71.7	72.4	73.0	73.5	74.0	74.5	75.0
26	69.0	69.7	70.4	71.1	71.8	72.6	73.1	73.6	74.1	74.6	75.1
27	69.1	69.8	70.5	71.2	72.0	72.7	73.2	73.7	74.2	74.7	75.3
28	69.2	69.9	70.6	71.4	72.1	72.8	73.3	73.8	74.3	74.9	75.4
29	69.3	70.0	70.7	71.5	72.2	72.9	73.4	74.0	74.5	75.0	75.5
30	69.4	70.1	70.9	71.6	72.3	73.0	73.6	74.1	74.6	75.1	75.6
31	69.5	70.3	71.0	71.7	72.4	73.2	73.7	74.2	74.7	75.2	75.8
32	69.6	70.4	71.1	71.8	72.6	73.3	73.8	74.3	74.8	75.4	75.9
33	69.8	70.5	71.2	71.9	72.7	73.4	73.9	74.4	75.0	75.5	76.0
34	69.9	70.6	71.3	72.1	72.8	73.5	74.0	74.6	75.1	75.6	76.1
35	70.0	70.7	71.4	72.2	72.9	73.6	74.2	74.7	75.2	75.7	76.3
36	70.1	70.8	71.6	72.3	73.0	73.8	74.3	74.8	75.3	75.9	76.4
37	70.2	70.9	71.7	72.4	73.1	73.9	74.4	74.9	75.5	76.0	76.5
38	70.3	71.1	71.8	72.5	73.3	74.0	74.5	75.0	75.6	76.1	76.6
39	70.4	71.2	71.9	72.6	73.4	74.1	74.6	75.2	75.7	76.2	76.7
40	70.6	71.3	72.0	72.8	73.5	74.2	74.8	75.3	75.8	76.3	76.9
41	70.7	71.4	72.1	72.9	73.6	74.4	74.9	75.4	75.9	76.5	77.0
42	70.8	71.5	72.3	73.0	73.7	74.5	75.0	75.5	76.1	76.6	77.1
43	70.9	71.6	72.4	73.1	73.9	74.6	75.1	75.6	76.2	76.7	77.2
44	71.0	71.7	72.5	73.2	74.0	74.7	75.2	75.8	76.3	76.8	77.4
45	71.1	71.9	72.6	73.3	74.1	74.8	75.4	75.9	76.4	77.0	77.5
46	71.2	72.0	72.7	73.5	74.2	74.9	75.5	76.0	76.5	77.1	77.6
47	71.3	72.1	72.8	73.6	74.3	75.1	75.6	76.1	76.7	77.2	77.7
48	71.4	72.2	72.9	73.7	74.4	75.2	75.7	76.2	76.8	77.3	77.8
49	71.6	72.3	73.1	73.8	74.5	75.3	75.8	76.4	76.9	77.4	78.0
50	71.7	72.4	73.2	73.9	74.7	75.4	75.9	76.5	77.0	77.6	78.1

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Flight Idle N2 Table (Sheet 2/2)
Figure 525

(5)Flight (approach) idle N2 table
- with Ring Case Compressor (RCC) engines
- identified with EPP PN 54DXXX series
- approach idle N2% setting for timed acceleration test

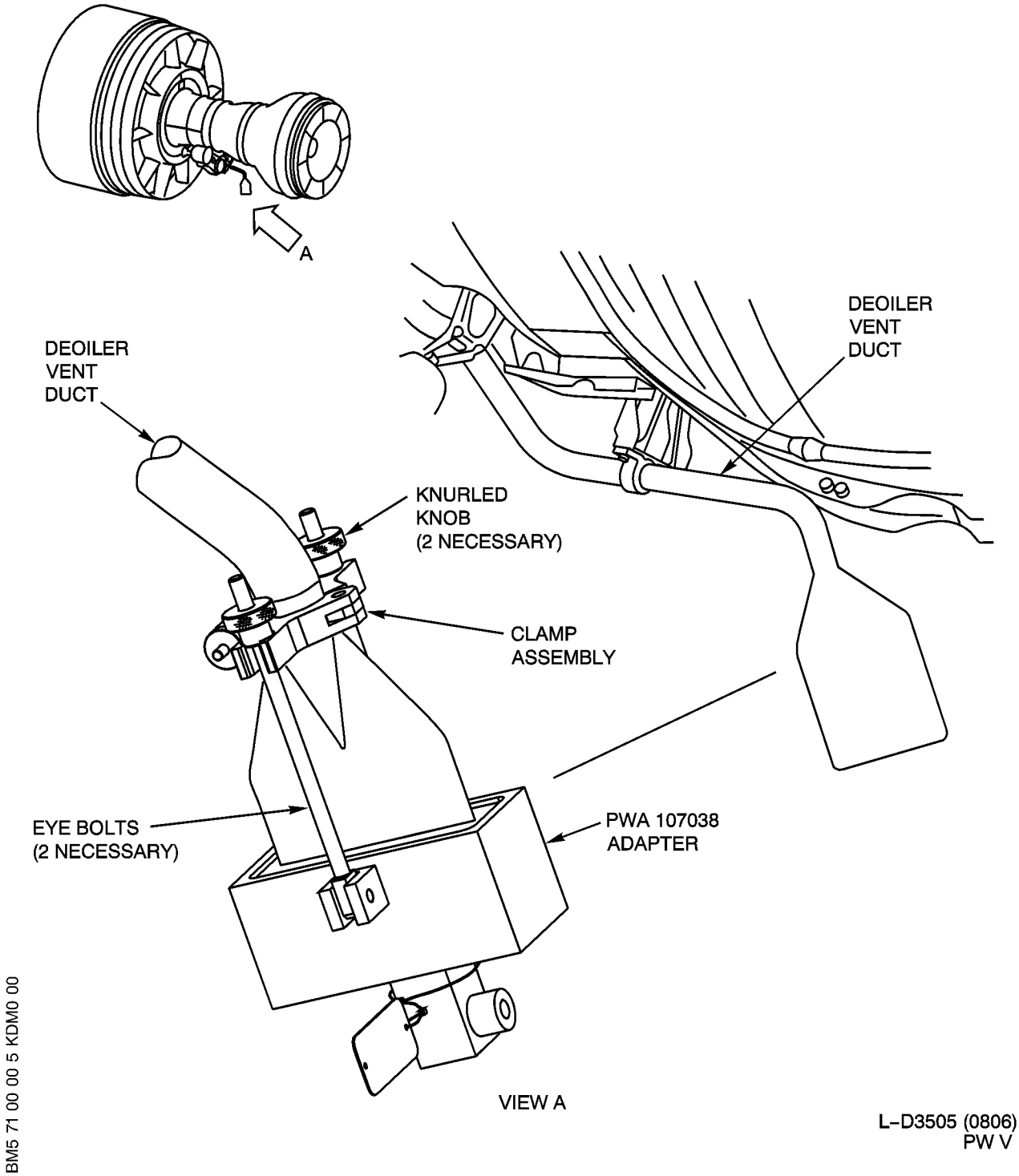
TAM °C	Altitude (Pressure Altitude Feet)							
	0	200	400	800	1000	2000	3000	5000
-16	65.8	65.9	66.0	66.1	66.1	66.4	66.7	67.3
-14	66.1	66.2	66.2	66.3	66.4	66.7	67.0	67.5
-12	66.4	66.4	66.5	66.6	66.6	66.9	67.2	67.8
-10	66.6	66.7	66.7	66.8	66.9	67.2	67.5	68.1
-6	67.1	67.2	67.2	67.3	67.4	67.7	68.0	68.6
-4	67.4	67.4	67.5	67.6	67.7	67.9	68.2	68.8
-2	67.6	67.7	67.7	67.8	67.9	68.2	68.5	69.1
0	67.9	67.9	68.0	68.1	68.2	68.4	68.7	69.3
2	68.1	68.2	68.2	68.3	68.4	68.7	69.0	69.6
4	68.4	68.4	68.5	68.6	68.7	68.9	69.2	69.8
6	68.6	68.7	68.7	68.8	68.9	69.2	69.5	70.1
8	68.8	68.9	69.0	69.1	69.1	69.4	69.7	70.3
10	69.1	69.1	69.2	69.3	69.4	69.7	70.0	70.6
12	69.3	69.4	69.5	69.6	69.6	69.9	70.2	70.8
14	69.6	69.6	69.7	69.8	69.9	70.2	70.5	71.1
16	69.8	69.9	69.9	70.1	70.1	70.4	70.7	71.3
18	70.1	70.1	70.2	70.3	70.4	70.7	71.0	71.6
20	70.3	70.4	70.4	70.5	70.6	70.9	71.2	71.8
22	70.5	70.6	70.7	70.8	70.8	71.2	71.5	72.1
24	70.8	70.8	70.9	71.0	71.1	71.4	71.7	72.3
26	71.0	71.1	71.1	71.3	71.3	71.6	71.9	72.6
28	71.3	71.3	71.4	71.5	71.6	71.9	72.2	72.8
30	71.5	71.6	71.6	71.7	71.8	72.1	72.4	73.0
32	71.7	71.8	71.8	72.0	72.0	72.3	72.7	73.3

Table 503A

R N. test No. 5 - Oil System Static Leak Test
(1)Equipment and Materials

ITEM	DESIGNATION
(a)PWA85844	Adapter
(b)PWA107038	Adapter, Vacuum/Leak Check (Optional to PWA85844)
(c)	Regulated Air Supply Capable of Pressurizing Oil System to 10 PSIG (0.689 bars)
(d)	Appropriate Hoses and Fitting for Connecting to Oil System
(e)	Pint Bottle of Water
(f)Material No.P05-007	Special Materials (Ref. 70-00-00)
(g)Material No.P05-068	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 79-23-03, P. Block 401	Deoiler Vent Duct

(2)General
(a)The static leak test consists of pressurizing the gearbox with air through an external adapter connected to the deoiler vent duct, and checking for leaks.
10 psig (0.689 bars) of internal pressure is sufficient to determine leakage. Higher pressure may unseat carbon seals in main shaft bearing compartments which are connected to the gearbox via shaft housings or oil lines.
(3)Perform oil system static leak test
(a)Open right fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(b)To install the PwA85844 adapter, do as follows :
1 Remove rear portion of deoiler vent duct (Ref. 79-23-03, P. Block 401).
2 Install PWA85844 adapter and air line to tube coupling on remaining portion of deoiler vent duct.
(c)To install the optional PWA107038 adapter, do as follows : (Ref. Fig. 526).
1 Install the clamp assembly on the round section near the end of the deoiler vent duct.
2 Put the base assembly on the end of the deoiler vent duct.
3 Align the slots in the clamp assembly with the two eyebolts.
4 Install the eyebolts into the clamp assembly and tighthen with the two knurled knobs.
5 Tighten the knurled knob on the clamp assembly.
6 Cap one end fitting and attach filtered shop air to the other fitting
CAUTION : DO NOT EXCEED 10 PSIG (0.689 Bars) PRESSURE IN GEARBOX OR 325°F (163°C) TEMPERATURE IN GEARBOX. DO NOT MOTOR ENGINE DURING TEST. MOTORING ENGINE WHILE OIL SYSTEM IS PRESSURIZED WILL CAUSE OIL CONTAMINATION OF COMPRESSORS AND GASPATH.
(d)Apply and maintain 10 psig (0.689 Bars) regulated pressure in gearbox using clean dry air supply having a temperature less than 325°F (160°C) or portable nitrogen (Material No.P05-068). Monitor pressure indication to prevent more than 10 psig (0.689 Bars) in gearbox.
NOTE : Pressure of less than 7 psig (0.483 Bars) is insufficient to provide adequate results. 10 psig (0.689 Bars) of internal pressure is sufficient to determine leakage. Higher pressure may unseat carbon seals in main shaft bearing compartments which are connected to the gearbox via shaft housings or oil lines.
(e)Using Material No.P05-007 or soap and water solution, check for leaks at following places :
1 All gearbox pad seals without overboard drains.
2 All connections to deoiler.
3 All gearbox, angle gearbox, and lay shaft connections.
4 All gearbox housing covers and fittings.
5 All oil supply lines from oil pump to bearing compartments.
(f)Connect hose to each gearbox pressure test fitting (four places) in the Drain Manifold/Test Box and to the inspection tee of the front



PWA107038 Adapter Installation
Figure 526

hydraulic pump drain line. Immerse free end in pint bottle of water. Some leakage may be expected. In this case it would be possible to slowly count the number of air bubbles. Any seal which leaks sufficient air to vigorously agitate water is unsatisfactory.

(g)Release pressure from gearbox.

(h)Repair leaks and retest as necessary.

R (j)Remove PWA85844 or PWA107038 adapter and air line.

R (k)If removed, reinstall rear portion of deoiler vent duct (Ref. 79-23-03, P. Block 401).

R (l)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

R P. Test No. 6 - FADEC - Idle Test

(1)General

The following FADEC parameters must be monitored during all engine testing.

(a)Analog parameters

1 Low rotor speed : N1

2 High rotor speed : N2

3 EGT temperature

(2)Procedure

CAUTION : WHEN THE FADEC IS REPLACED, OR REMOVED AND REINSTALLED, YOU MUST DO A STATIC TEST (REF. TEST NO. 7) BEFORE YOU DO THIS TEST AND ALL OTHER TESTS.

(a)Prepare, service and start engine as described in 71-00-00, P. Block 201.

(b)Allow N2 to stabilize for 5 minutes.

(c)Use indicators to verify reception of N1, N2, EGT, EPR, FF and check that operating indications are within the operating limits (Ref. 71-00-00, P. Block 201).

(d)Shut down engine as described for normal operation (Ref. 71-00-00, P. Block 201).

(e)Perform Test No. 7 - FADEC - Static Test.

(f)Perform any required maintenance.

R Q. Test No. 7 - FADEC - BITE Display Test (Ref. 73-38-00, P. Block 501)

R R. Test No. 8 - Vibration Survey

(1)General

(a)The procedures and guidelines described in this test apply to ground test of engines during maintenance and do not apply to flight operation.

WARNING : BEFORE STARTING ONE OR BOTH ENGINES ALL SAFETY AND OPERATING PRECAUTIONS MUST BE OBSERVED TO IMMOBILIZE AIRCRAFT (REF. 2.E.).

CAUTION : IF ENGINE SURGE IS ENCOUNTERED, RAPIDLY (IN LESS THAN ONE SECOND) RETARD THROTTLE CONTROL LEVER TO MINIMUM IDLE, MOVE HP FUEL SOV CONTROL LEVER TO OFF POSITION AND MOTOR ENGINE UNTIL EGT HAS BEEN DRIVEN BELOW 356°F (180°C). REFER TO START PROCEDURE FOLLOWING EMERGENCY SHUTDOWN. FOR RESTARTING ENGINE. (REF. 71-00-00, P. BLOCK 201) FAILURE TO FOLLOW START PROCEDURE FOLLOWING EMERGENCY SHUTDOWN MAY RESULT IN DAMAGE TO TURBINE BLADE TIP SEALS.

(2)Test Procedure

(a)Make certain that ECAM system is operating (Ref. 31-51-00, P. Block 1).

R (b)Obey the safety and operating precautions as described in Paragraph 2.
R (Ref. 71-00-00, P. Block 501).

R (c)Prepare and start engine as described in 71-00-00, P. Block 201.

R (d)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.

R (e)There must be two qualified persons in the cockpit when performing
R an engine run above idle. One must monitor the outside and the
R aircraft behaviour while the other performs the engine test.

R (f)If the aircraft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.

R (g)Allow engine to stabilize at IDLE N2 rpm for five minutes.

R (h)Check that operating indications are within operating limits.

R (j)Slowly accelerate engine to 1.3 EPR and let the engine become thermally stable for 3 minutes.

NOTE : Vibration survey must be conducted on a thermally stabilized engine.

R (k)Return engine to IDLE N2 rpm.

R (l)Slowly advance forward throttle control lever at a uniform rate requiring 90 - 120 seconds to accelerate from stabilized IDLE to 1.4 EPR, and then slowly retard trottle control 1.4 EPR back to IDLE.

NOTE : Rate of transcient operation must be sufficiently slow to permit recognition of vibration peak.

1 During transient operation observe engine vibration for N1 and N2 on right ECAM DU (ENGINE page).

2 During transient operation, N1 and N2 engine vibration could reach one or more peak conditions at certain speeds between IDLE and 1.4 EPR. Record %N1 and %N2 rpm indications at which respective N1 and N2 vibration peaks occur.

R (m)Stabilize engine for 30 seconds at RPM indications at which each peak vibration was observed and record mean N1 and N2 vibrations

and respective %N1 or %N2 speeds.

R (n)Mean vibration indication shall not exceed the acceptance levels shown in 71-00-00, P. Block 201 (Engine Operating Limits) after 30 seconds of engine stabilization. If exceeded, repair and retest as required.

R (p)Return engine to IDLE N2 rpm and operate for five minutes for cooling.

R (q)Shut down engine (Ref. 71-00-00, P. Block 201).

R S. Test No. 9 - Performance Test

(1)General

(a)Replacement of a module can affect engine performance, engine EGT margin, compressor surge margin, rotor speeds, turbine cooling and bearing thrust loading. In order to maintain engine performance and safety, performance testing is required as specified in the Test Reference Table.

NOTE : The requirement to check the turbine cooling air ratio (TCAR) has been removed from all the PW4000 Engine and Maintenance Manuals. Review of field experience showed that the assembly instructions and TOBI flow checks are adequate to ensure proper operation.

Strict adherence to the assembly and check procedures defined in the Engine Manual and Service Bulletins (SB) must be maintained.

The removal of the requirement to check TCAR to limits supersedes any and all related Engine Manual and Service Bulletin requirements for TCAR limits checks.

(b)The airplane displays of EPR, %N1, %N2 and EGT can be used for the performance test provided all systems are indicating accurately.

NOTE : Small throttle control lever movements near idle will cause a transient overshoot. This condition will cause the engine parameters to rise and then to return to idle. Throttle movements beyond this point will result in normal engine operation.

(c)This test is conducted at approximately 1.3 EPR to minimize both power level and duration at high power. Since this test is the only required engine check designed to indicate engine component deficiencies, accurate leak-free instrumentation is required to measure engine pressures.

(d)An acceleration/deceleration time check and/or a vibration check may be required during this test. Refer to Test Reference Table for requirements.

(e)For engine operating limits, procedures, safety precautions, and other related information (Ref. 71-00-00, P. Block 201).

(f)This test should not be performed when weather conditions require the nacelle anti-icing system to be in operation, because the test curves based on a no-airbleed condition.

1 If performance testing must be performed when icing conditions prevail, the nacelle anti-icing system must be kept on during all engine operation except for the last 30 seconds of each test stabilization period and during recording.

(g)Sample calculations are provided at the end of this test to assist in engine data evaluation.

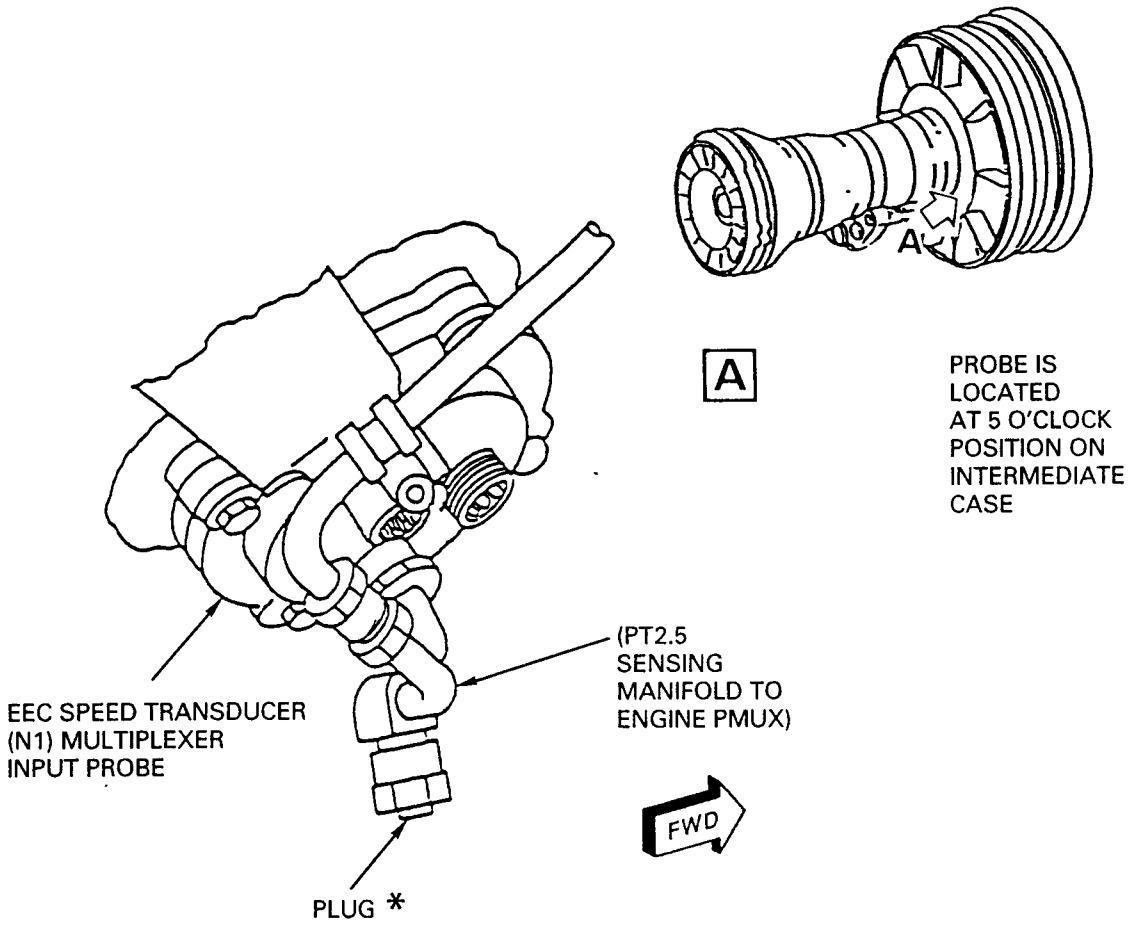
(2)Instrumentation requirements

Parameter	Range	Accuracy
(a) PT2.5 (If Available)	0 - 50 psig	± 0.06 psi
(b) PS3 (Optional)	0 - 400 psig	± 0.5 psi
(c) PS4I (Optional)	0 - 400 psig	± 0.5 psi

(3)Prepare to test engine performance
(a)Install pressure monitoring equipment (Ref. Fig. 527).
1 Install PT2.5 probe.
2 Remove caps from PS4I ports and plug from PS3 port and connect PT2.5, PS4I and PS3 hoses to test ports and probe engine, (PS4I/PS3 is optional, it is used if TCAR check is desired). PS3 EEC can be used for PS3/PT2.5 check.
3 Arrange hoses in bundle and tie with braid as desired to facilitate cowl closing.
4 Connect and position PT2.5, PS4I and PS3 gages.
(b)Engine icing may occur when visible moisture is present and outside air temperature (OAT) is below 8°C.
NOTE : Visible moisture is defined as rain, snow or fog (visibility of one mile (1.6 kilometer) or less).
(4)Test engine performance
WARNING : BEFORE STARTING ONE OR BOTH ENGINES ALL SAFETY AND OPERATING PRECAUTIONS MUST BE OBSERVED TO IMMOBILIZE AIRCRAFT (REF. 2.E.).

CAUTION : IF ENGINE SURGE IS ENCOUNTERED, RAPIDLY (IN LESS THAN ONE SECOND) RETARD THROTTLE CONTROL LEVER TO GROUND IDLE MINIMUM IDLE), MOVE HP FUEL SOV CONTROL LEVER (START LEVER) TO OFF POSITION AND MOTOR ENGINE UNTIL EGT HAS BEEN DRIVEN BELOW 356°F (180°C). (REF. 71-00-00, P. BLOCK 201), REFER TO START PROCEDURE FOLLOWING EMERGENCY SHUTDOWN TO AVOID DAMAGE TO ENGINE. (Ref. 71-00-00, P. Block 201).

R (a)Obey the safety and operating precautions as described in Paragraph 2.
R (Ref. 71-00-00, P. Block 501).
R (b)Prepare and start engine to be tested as described for normal engine operation. (Ref. 71-00-00, P. Block 201).
R (c)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.
R (d)There must be two qualified persons in the cockpit when performing
R an engine run above idle. One must monitor the outside and the
R aircraft behaviour while the other performs the engine test.
R (e)If the aircraft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.
R (f)Allow engine to idle for five minutes.
R (g)Monitor vibration indications during five minute stabilization period and while accelerating and decelerating.
R (h)Check that operating indications are within operating limits (Ref. 71-00-00, P. Block 201).
NOTE : Guidelines for expected performance levels are provided in "Typical Operating Ranges" Table.
R (j)Ensure that following systems are off for engine being tested.
NOTE : These systems must be off during test because the test limits are based on no load and no bleed air conditions.
1 Engine bleed air.
2 Engine and wing anti-ice unless required.
3 Integrated drive generator (IDG).
CAUTION : TURBINE COOLING AIR PRESSURE RATIO SHOULD BE MONITORED

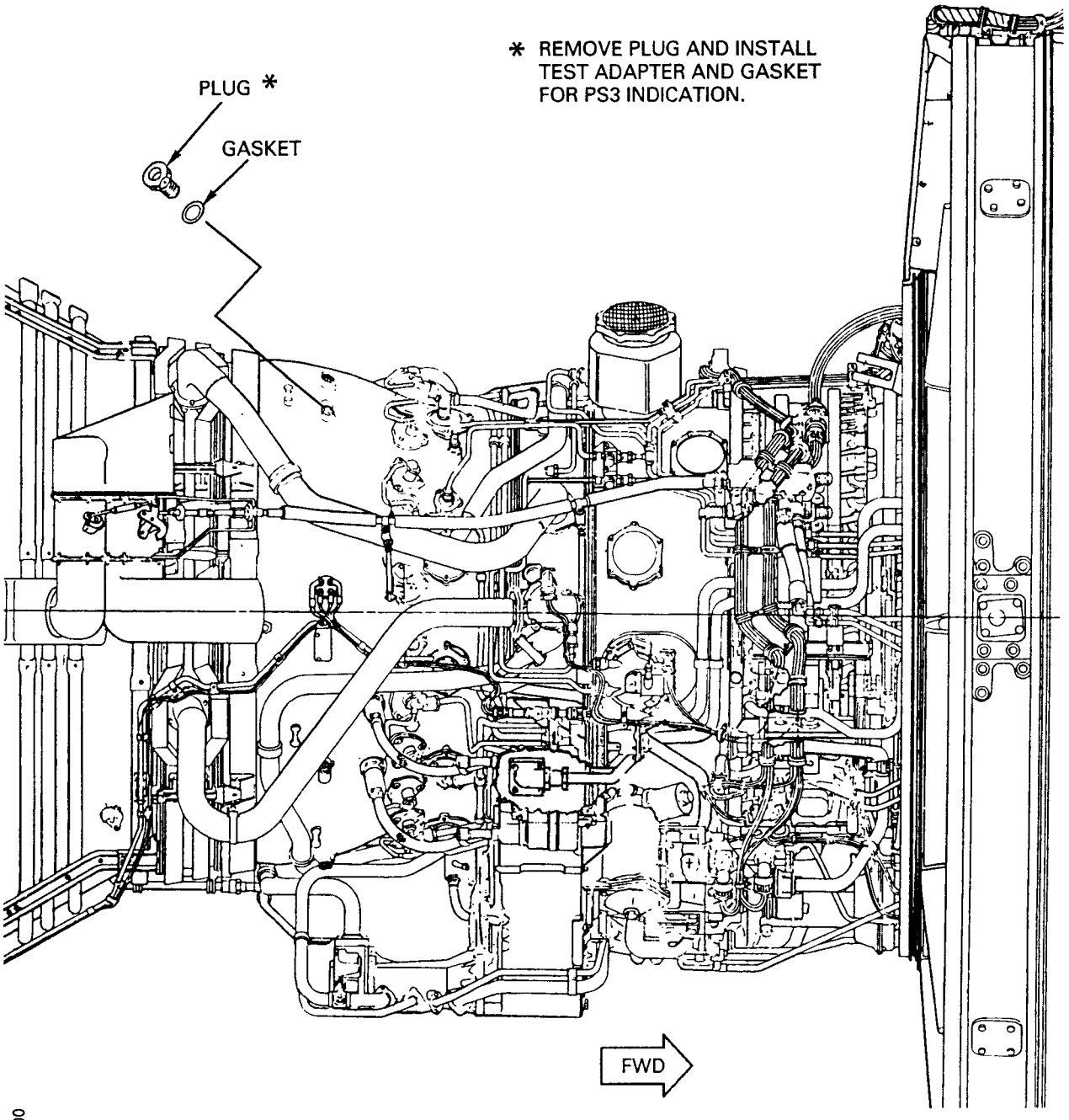

A
PROBE IS LOCATED AT 5 O'CLOCK POSITION ON INTERMEDIATE CASE
(PT2.5 SENSING MANIFOLD TO ENGINE PMUX)
EEC SPEED TRANSDUCER (N1) MULTIPLEXER INPUT PROBE
FWD
PLUG *

* REMOVE PLUG AND INSTALL TEST ADAPTER FOR PT2.5 INDICATION.

L-A7509 (0000)

BM5 71 00 00 5 KXMA - 00

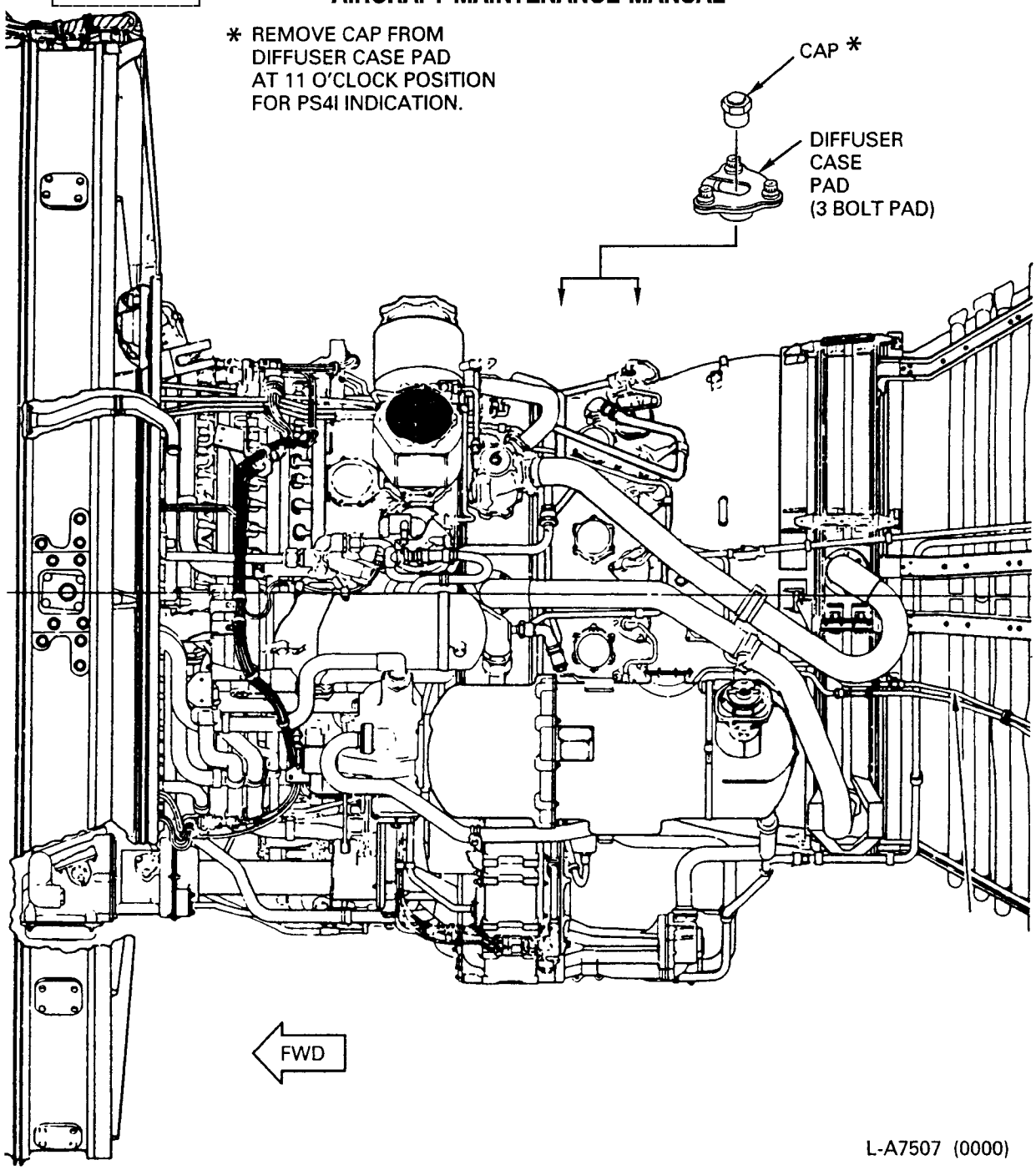
PT2.5, PS3, and PS4I Test Port Locations (Sheet 1/3)
Figure 527



L-A7508 (0000)

BM5 71 00 00 5 KXMJ - 00

PT2.5, PS3, and PS4I Test Port Locations (Sheet 2/3)
Figure 527


* REMOVE CAP FROM DIFFUSER CASE PAD AT 11 O'CLOCK POSITION FOR PS4I INDICATION.
CAP *
DIFFUSER CASE PAD (3 BOLT PAD)
FWD
L-A7507 (0000)

BM5 71 00 00 5 KXMS - 00

PT2.5, PS3, and PS4I Test Port Locations (Sheet 3/3)
Figure 527

WHENEVER AN ENGINE IS OPERATED AT POWERS ABOVE IDLE TO ENSURE THAT THE REQUIRED AMOUNT OF COOLING AIR IS BEING SUPPLIED TO THE TURBINE. DEVIATION FROM THE TURBINE COOLING AIR CHECK CURVE ABOVE BLEED CLOSING CAN AFFECT ENGINE PERFORMANCE AND CAUSE ENGINE DAMAGE.

R (k)If vibration survey is required, perform test No. 8 at this time.

R (l)Take off power and turbine cooling air pressure radio check

1 Advance thrust lever to 1.3 EPR position and allow engine to stabilize for 5 minutes.

2 Check that TARGET EPR is obtained. Record the position of the thrust lever. You will need this position indication for the Accel/Decel test which follows.

3 Record the following :
EPR ; %N1, %N2, EGT ; PT2.5 (if available) ; PS3 (optional) ; PS4I (optional) ; Specific Humidity ; PT2 ; TT2 and record throttle control lever position (TLA) for later use.

NOTE : IF PT2 and TT2 are not available true local barometric pressure (PAMB) and ambient temperature (outside air temperature, OAT) can be subsituted in all calculations.
Determine OAT in shade of airplane nose gear.
Guidelines for expected performance levels are provided in "Typical Operating Ranges" Table.

4 Return thrust lever to idle position.

R (m)(Optional) Check that calculated turbine cooling air pressure ratio is within limits.

1 Calculate observed N2 (rpm) :
Observed N2 rpm = %N2 X 9900 rpm

2 Calculate turbine cooling air pressure ratio :

$$= \frac{PS4I}{PT3} = 0.97\ \frac{PS4I}{PS3}$$

3 If optional PS4I and PS3 instrumentation is installed, check that PS4I/PS3 is as expected based on the operators' experience.

R (n)Acceleration/deceleration check :

1 Prepare for the test as per Engine Test No. 4.

2 Perform the acceleration/deceleration test as per Engine Test No. 4.

NOTE : The requirements specified in the Engine Test No. 4, steps (4)(c) thru (4)(h) can be satisfied by step (4)(g) specified above.

R (p)Inspect engine and engine mounted accessories for evidence of fuel, oil and hydraulic leaks.

NOTE : During visual inspection of oil tubes for condition, security and leakage, a very small amount of oil wetness might be observed on variable vane arm retention bolts near the bottom of the engine, or in the nose cone/spinner. The source of this oil has been identified as the No. 2 Bearing Carbon Seal Assembly. It is normal, especially following engine windmilling or an extended start sequence, that a small amount of oil would seep past the

No. 2 Bearing Carbon Seal Assembly and then accumulate, after engine shutdown, on the variable vane arm retention bolts. This amount of oil seepage is an acceptable and normal condition and is not cause to remove the engine from service as long as other inspection criteria for oil leaks from engine oil tubes are met.

R (q)Correct recorded stabilized data : (Ref. Fig. 528)

NOTE 1 : KHN1, KHN2, KHT4. 95 are determined from (Ref. Fig. 529) A300-600/A310 Acceptance to limits table EPR=1.30 includes segmented and RCC* HPC configurations.

Model	EPP PN **	N1C max limit rpm. See NOTE B.	N2C limit rpm. See NOTE B.	EGTC limits degrees C. See NOTES A and B
Phase 1/PW41XX				
PW4152	51D410/ 51D411	3100	9095	495
PW4152	54D330	3100	8995	495
PW4156A	51D446/ 51D447	3100	9130	500
PW4156A	54D334	3100	9030	500
PW4158	51D434/ 51D435	3105	9186	500
PW4158	54D338	3105	9020	500
Phase 3/PW41XX (-3)				
PW4152 (-3)	51D454/ 51D455	3130	9360	496
PW4152 (-3)	51D454/ 51D455 (See NOTE C)	3130	9231	496
PW4152 (-3)	54D333	3130	9310	496
PW4156A (-3)	51D448/ 51D449	3100	9465	497
PW4156A (-3)	51D448/ 51D449 (See NOTE C)	3100	9345	497
PW4156A (-3)	51D432/ 51D433	3100	9305	497
PW4156A (-3)	54D335	3100	9420	497
PW4158 (-3)	51D440/ 51D441	3100	9465	497
PW4158 (-3)	51D440/ 51D441 (See NOTE C)	3100	9345	497
PW4158 (-3)	51D408/ 51D409	3100	9305	497
PW4158 (-3)	54D360	3100	9420	497
Intermix -1C/-1E PW41XX (-1C/-1E)				

Model	EPP PN **	N1C max limit rpm. See NOTE B.	N2C limit rpm. See NOTE B.	EGTC limits degrees C. See NOTES A and B
PW4152 (-1C/-1E)	51D456/ 51D457	3155	9175	503
PW4152 (-1C/-1E)	54D331/	3155	9150	503
PW4156A (-1C/-1E)	51D450/ 51D451	3130	9260	507
PW4156A (-1C/-1E)	54D336/	3130	9180	507
PW4158 (-1C/-1E)	51D442/ 51D443	3130	9260	507
PW4158 (-1C/-1E)	54D339	3130	9260	507
Intermix - 3A PW41XX (-3A)				
PW4152 (-3)	51D458/ 51D459	3100	9370	495
PW4152 (-3)	51D458/ 51D459 (See NOTE C)	3100	9240	495
PW4152 (-3)	54D332	3100	9320	495
PW4156A (-3)	51D452/ 51D453	3065	9475	497
PW4156A (-3)	51D452/ 51D453 (See NOTE C)	3065	9350	497
PW4156A (-3)	51D430/ 51D431	3065	9305	497
PW4156A (-3)	54D337	3065	9430	497
PW4158 (-3)	51D444/ 51D445	3065	9475	497
PW4158 (-3)	51D444/ 51D445 (See NOTE C)	3065	9350	497
PW4158 (-3)	51D436/ 51D437	3065	9305	497
PW4158 (-3)	54D361	3065	9430	497

N1, N2, and EGT Acceptance Limits A300-600/A310 Installations
Table 504

NOTE A : Subtract 13 degrees C from table value if HPT clearances have been restored and the engine has not been in service.
NOTE B : For procedure for correcting N1, N2 and EGT stabilized 1.3 EPR data, (Ref. Fig. 528).
NOTE C : Engines with EEC PN 54D092 only.
NOTE D : Calculate the corrected parameters:
100% N1=3600 rpm,
100% N2=9900 rpm,
N1C=36*N1% obs/SRT Theta

N2C=99*N2% obs/SRT Theta
Theta = (Tamb C + 273.15)/288.15
EGTC = -273.15 + (EGT obs + 273.15)/Theta
* Ring Case Compressor (RCC) HPC configuration upgrade by PW4ENG 72-756 or 72-759, requires EPP PN 54D3XX series.
** EEC EPP PN installed, see data plate information for EPP part number. If EPP part number look-up is required, see SB PW4ENG 73-203.

R (r)Compare the corrected data at 1.3 EPR and check for acceptability as follows:

1 Find the N1C, N2C, and EGTC limits by engine model and EEC programming plug part number as shown in Table 504.

2 Do an N2 Speed Limit Analysis by comparing the engine value calculated in the above step (k) to the "Correct the recorded stabilized data" with the N2C limit value obtained in the above step (l)1. The engine must demonstrate margin to the limit.

3 Do an N1 Speed Limit Analysis by comparing the engine value calculated in the above step (k) to "Correct the recorded stabilized data" to the N1C limit value obtained in the above step (l)1. The engine must demonstrate margin to the limit.

4 Do an EGT Limit Analysis by comparing the engine value calculated in the above step (k) to "Correct the recorded stabilized data" with the EGTC limit value obtained in the above step (l)1. The engine must demonstrate margin to the limit.

5 (Ref. Fig. 530) to shows the additional EGT margin available at various ambient temperatures. See the following EXAMPLE.

EXAMPLE :
The engine model used in this example is a PW4158 (-3), EPP PN 54D360
From performance calibration:
Corrected EGT = 480°C
Corrected N1 = 3000 rpm
EPR = 1.3
Corrected N2 = 9300 rpm
Table 504 Limit Values are as follows:
EGT Limit = 497°C
N1 = 3100 rpm
N2 = 9420 rpm
Margin calculations:
EGTc margin = 497°C - 480°C = 17°C
N1 margin = 3100 rpm - 3000 rpm = 100 rpm
N2 margin = 9420 rpm - 9300 rpm = 120 rpm
Additional EGT margin at sea level on a 20°C day from (Ref. Fig. 530) = +28°C
EGT margin for a sea level takeoff on a 20°C day (17°C + 28°C) = 45°C.

R (s)Check the LPC/HPC pressure ratio (if available).

1 Low pressure compressor pressure ratio check. Obtain the value calculated in (Ref. Fig. 528). Compare the calculated value to guideline 1.98 to 2.34 ratio.

2 High pressure compressor ratio check. Obtain the value calculated in (Ref. Fig. 528). Compare the calculated value to guideline to 8.5 to 9.95 ratios.

NOTE : The above bands are guidelines only and not acceptance limits.

R (t)Repair and retest as necessary.

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

R (r)Compare the corrected data at 1.3 EPR and check for acceptability as follows:

1 Find the N1C, N2C, and EGTC limits by engine model and EEC programming plug part number as shown in Table 504.

2 Do an N2 Speed Limit Analysis by comparing the engine value calculated in the above step (k) to the "Correct the recorded stabilized data" with the N2C limit value obtained in the above step (l)1. The engine must demonstrate margin to the limit.

3 Do an N1 Speed Limit Analysis by comparing the engine value calculated in the above step (k) to "Correct the recorded stabilized data" to the N1C limit value obtained in the above step (l)1. The engine must demonstrate margin to the limit.

4 Do an EGT Limit Analysis by comparing the engine value calculated in the above step (k) to "Correct the recorded stabilized data" with the EGTC limit value obtained in the above step (l)1. The engine must demonstrate margin to the limit.

5 (Ref. Fig. 531) to shows the additional EGT margin available at various ambient temperatures. See the following EXAMPLE.

EXAMPLE :

The engine model used in this example is a PW4158 (-3), EPP PN 54D360

From performance calibration:

Corrected EGT = 480°C

Corrected N1 = 3000 rpm

EPR = 1.3

Corrected N2 = 9300 rpm

Table 504 Limit Values are as follows:

EGT Limit = 497°C

N1 = 3100 rpm

N2 = 9420 rpm

Margin calculations:

EGTc margin = 497°C - 480°C = 17°C

N1 margin = 3100 rpm - 3000 rpm = 100 rpm

N2 margin = 9420 rpm - 9300 rpm = 120 rpm

Additional EGT margin at sea level on a 20°C day from (Ref. Fig. 531) = +28°C

EGT margin for a sea level takeoff on a 20°C day (17°C + 28°C) = 45°C.

R (s)Check the LPC/HPC pressure ratio (if available).

1 Low pressure compressor pressure ratio check. Obtain the value calculated in (Ref. Fig. 528). Compare the calculated value to guideline 1.98 to 2.34 ratio.

2 High pressure compressor ratio check. Obtain the value calculated in (Ref. Fig. 528). Compare the calculated value to guideline to 8.5 to 9.95 ratios.

NOTE : The above bands are guidelines only and not acceptance limits.

R (t)Repair and retest as necessary.

**ON A/C 101-200,

(Ref. Fig. 530)

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

(Ref. Fig. 531)

(a) Calculate pressure ratios:
(pressure in absolute levels).

1 Low pressure compressor pressure ratio

$$= \frac{PT2.5}{PT2 \times (\theta T2)^{-0.08}}$$

$$\theta T2 = \frac{TT2^{\circ}C + 273.16}{288.16}$$

2 High pressure compressor pressure ratio

$$= \frac{PS3}{PT2.5 \times (\theta T2)^{0.08}}$$

(b) Calculate corrected N1 (rpm):

$$N1/R\theta\ T2KH\ N1 = \frac{N1\ (rpm)}{R\ \theta T2 \times KH\ N1}$$

$$N1\ (rpm) = \%N1 \times 3600\ rpm$$

$$R\ \theta T2 = \sqrt{\frac{TT2^{\circ}C + 273.16}{288.16}}$$

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L-D2114 (0106)
PW V

Procedure for Corrected Stabilized Data (Sheet 1/2)
Figure 528

(c) Calculate corrected N2 (rpm):

$$N2/R\theta\ T2KH\ N2 = \frac{N2\ (rpm)}{R\ \theta T2 \times KH\ N2}$$

where, N2 (rpm) = %N2 x 9900 rpm

$$R\ \theta T2 = \sqrt{\frac{TT2^{o}C + 273.16}{288.16}}$$

(d) Calculate corrected EGT (^{o}C):

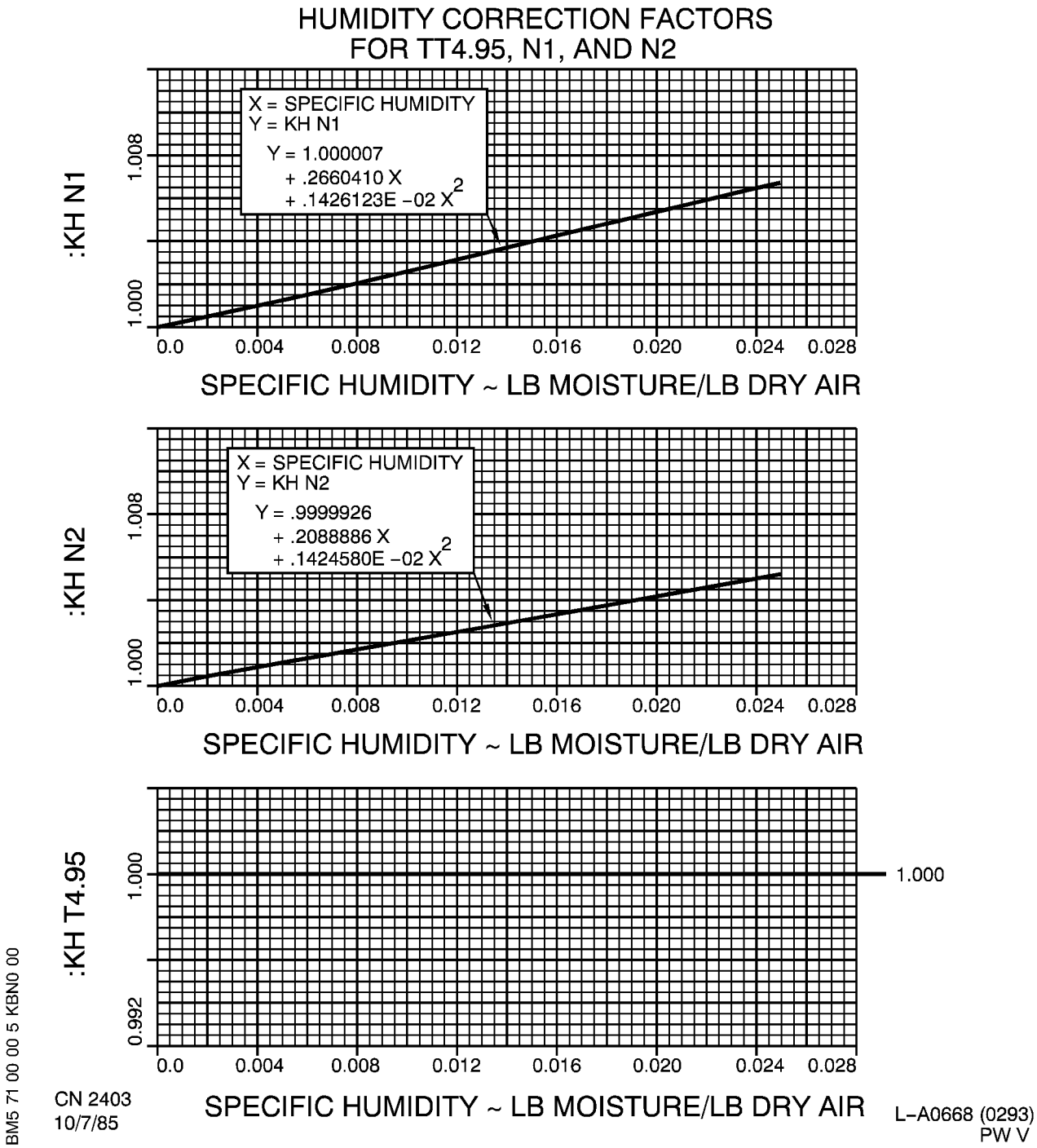
$$EGTC\ (^{o}C) = \left[\frac{EGT + 273.16}{\theta T2^{1.000} \times KH\ T4.95}\right] - \left[273.16\right]$$

$$\text{where, } \theta T2 = \left[\frac{TT2^{o}C + 273.16}{288.16}\right]$$

BM5 71 00 00 5 KARJ 00

L–D2115 (0106)
PW V

Procedure for Corrected Stabilized Data (Sheet 2/2)
Figure 528



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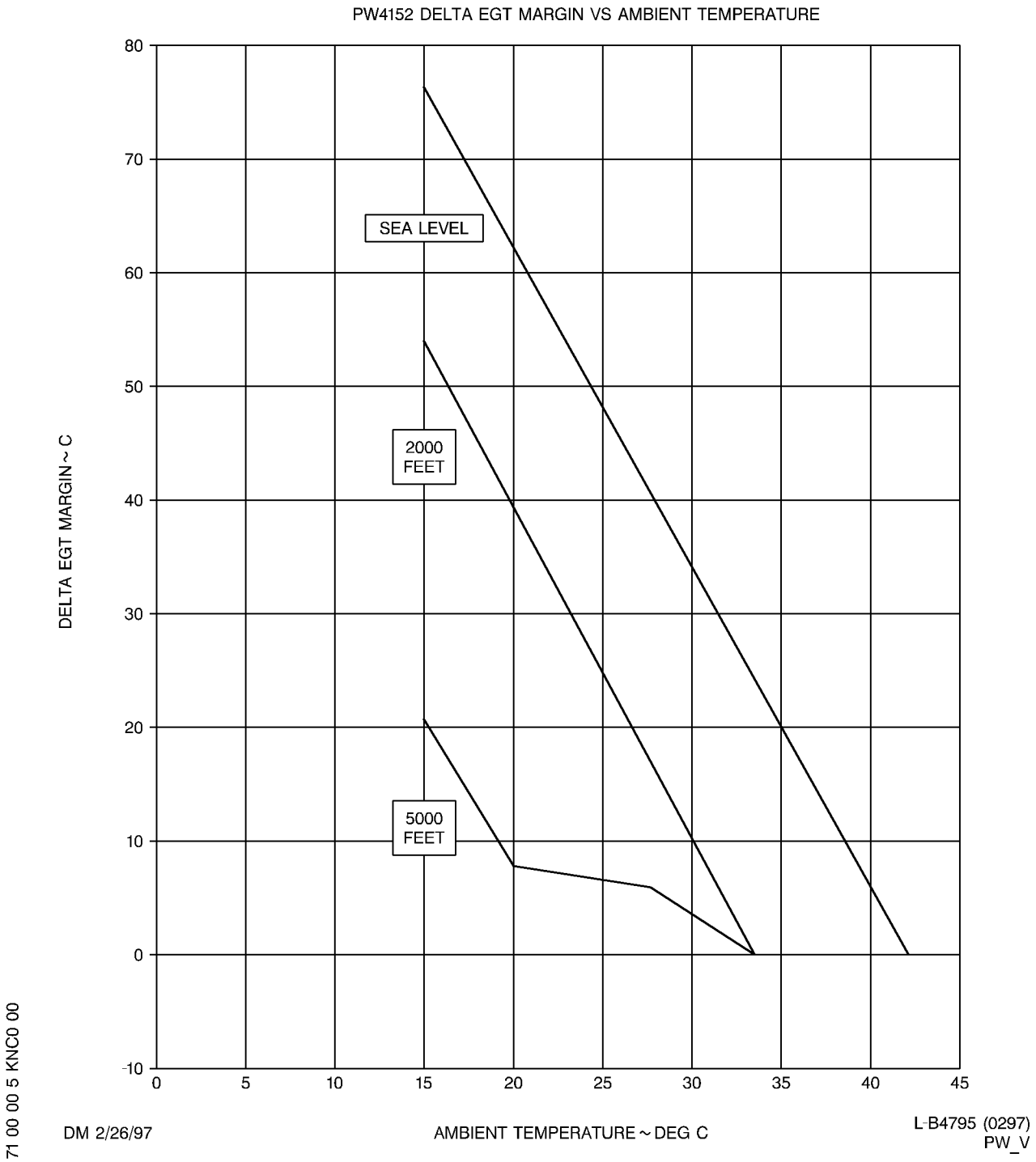
10/7/85

L-A0668 (0293)
PW V

Humidity Correction Factors
Figure 529



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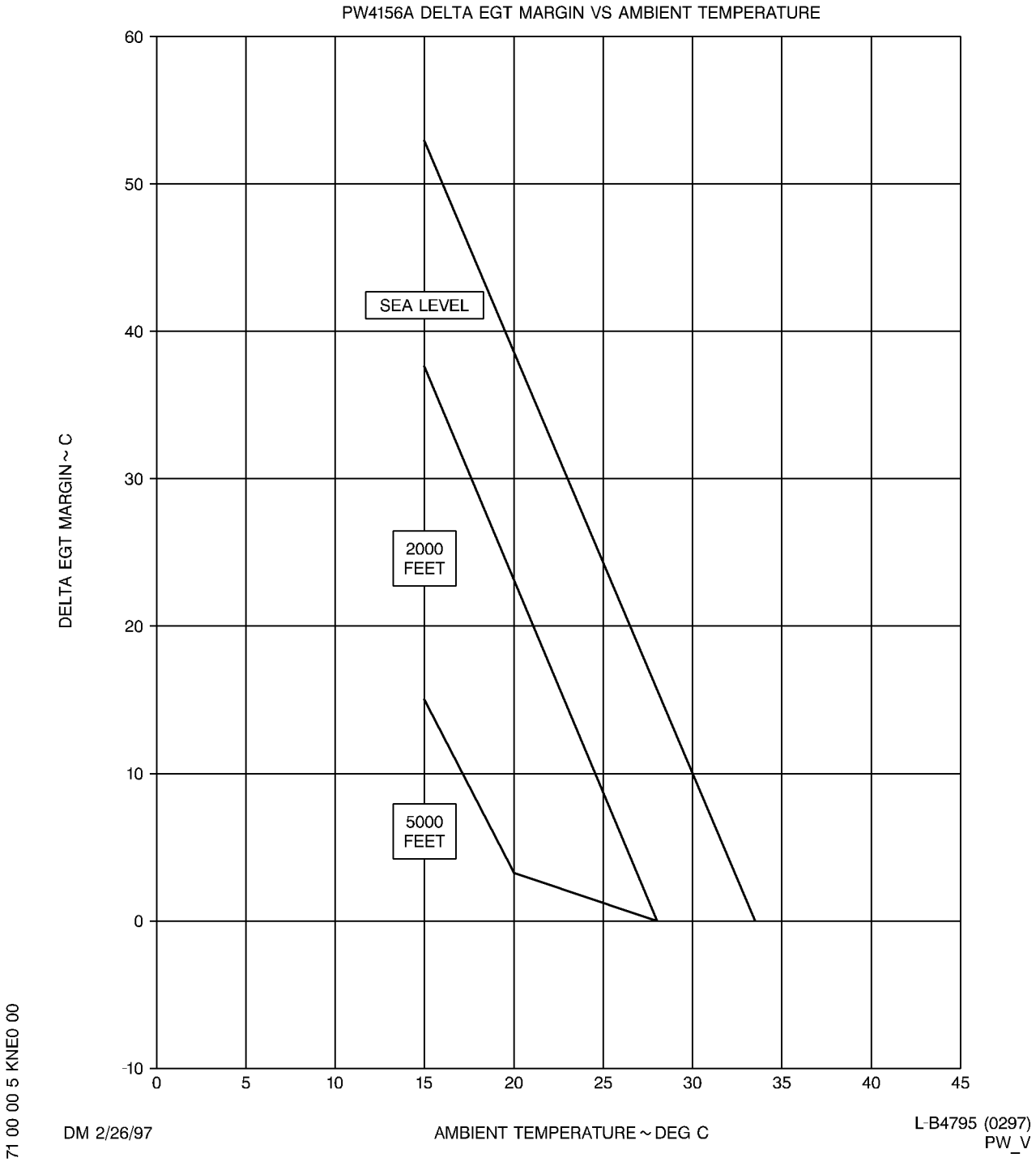
Delta EGT Margin - VS - Ambient Temperature
Figure 530



Delta EGT Margin - VS - Ambient Temperature
Figure 531

**ON A/C 101-200,

R T. Test No. 10 - Replacement Engine Test (Pretested)
(1)General
(a)When the engine is replaced, or removed and reinstalled, you must do a static test on the TEST - 07 before you do all other tests.
(b)This test is used to leak check and power check a newly installed engine which has been tested either in a test cell or on wing following refurbishment.
(c)If replacement engine has not been pretested, engine installation and operation must be checked by using procedures given in Test No. 11, Replacement Engine Test (Untested).
(2)Test procedure
(a)Do test - 07; FADEC static test
R (b)Obey the safety and operating precautions as described in Paragraph 2.
R (Ref. 71-00-00, P. Block 501)
R (c)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.
R (d)There must be two qualified persons in the cockpit when performing
R an engine run above idle. One must monitor the outside and the
R aircraft behaviour while the other performs the engine test.
R (e)If the aircaft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.
R (f)Prepare and start engine as described for normal engine operation (Ref. 71-00-00, P. Block 201)
1 Allow N2 rpm to stabilize at IDLE.
2 Check that operating indications are within operating limits.
R (g)After five minutes operation at IDLE , slowly move thrust lever forward until engine is at 80 % N2 rpm. Allows engine to stabilize for 15 - 20 seconds.
R (h)Slowly move thrust lever aft to IDLE position.
R (j)Allow engine to cool at IDLE N2 rpm for five minutes.
R (k)Shut down engine (Ref. 71-00-00, P. Block 201)
R (l)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
NOTE : During visual inspection of oil tubes for condition, security and leakage, very small amount of oil wetness might be observed on variable vane arm retention bolts near the bottom of the engine, or in the nose cone/spinner. The source of this oil has been identified as the No. 2 Bearing Carbon Seal Assembly.
It is normal, especially following engine windmilling or an extended start sequence, that a small amount of oil would seep past the No. 2 Bearing Carbon Seal Assembly and then accumulate, after engine shutdown, on the variable vane arm retention bolts.
This amount of oil seepage is an acceptable and normal condition and is not cause to remove the engine from service as long as other inspection criteria for oil leaks from engine oil tubes are met.
R (m)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

R U. Test No. 11 - Replacement Engine Test (Untested)

(1)General

(a)When the engine is replaced, or removed and reinstalled you must do a static test on the TEST - 07 before you do all other tests.

(b)This test is used to leak check and power check a newly installed engine which has not previously been tested either in a test cell or on wing following refurbishment.

(2)Test Procedure

(a)Do Test - 07, FADEC static test

(b)Perform test called for in Test Reference Table, as result of maintenance action taken. If the Test Reference Table does not require Test-09 to be performed as a result of maintenance action taken, then perform power check per Test No. 4

(c)After completing engine operation described in step (a), perform following :

(d)Open, fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

1 Clean or replace engine fuel system screens and filter elements as follows :

- Replace fuel pump filter element.
- Remove, clean and install fuel distribution valve strainer.

2 Check engine oil system filters and magnetic chip detectors as follows :

- Replace main oil filter element.
- Remove, clean and install magnetic chip detectors.

CAUTION : A MINIMUM OF FIVE MINUTES SHOULD ELASPE AFTER ENGINE SHUTDOWN BEFORE REMOVING OIL TANK FILLER CAP TO ALLOW TANK PRESSURE TO BLEED OFF.

3 Check engine oil tank for adequate servicing. If servicing is required (Ref. 12-13-79, P. Block 1).

4 Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

R V. Test No.12 - Engine Vacuum Test
(1)Equipment and Materials

ITEM	DESIGNATION
(a)CTE6075	Vacuum Cart
(b)PWA85498	Adapter
(c)PWA85843	Adapter
(d)PWA85845	Adapter
(e)PWA85978	Plug
(f)	Torque Wrench Up to 525 lbf.in. (up to 5.93 m.daN)
(g)	Circuit Breaker Safety Clips
(h)	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
R (j)Material No.P03-001	Oils (Ref. 70-00-00)
R (k)Material No.P05-289	Special Materials (Ref. 70-00-00)
R (l)Material No.P05-291	Special Materials (Ref. 70-00-00)
R (m)Material No.P05-292	Special Materials (Ref. 70-00-00)
R (n)Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 75-23-07, P. Block 401	Turbine Case Cooling (TCC) HPT Manifolds

(2)Procedure (Ref. Fig. 532, 533)
(a)Job Set-Up
1 Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors. (Ref. 71-13-00, P. Block 301).
(b)General
1 Find the airflow leakage into the bearing compartments.

BEARING COMPARTMENT	MAXIMUM AIRFLOW (PPH)
No. 1, 1.5, 2, 3 (Front and Rear), and Angle Gearbox	44
NO. 4	10

(c)Test procedure
1 (Pre SB PW4ENG 79-75) Disconnect and loosen the (LR06) No. 4 bearing oil scavenge tube assembly (Ref. Fig. 532) (Sheet 1/6) through (Sheet 4/6).
- Remove the bolt, nut and clamp which holds the spray shield to Flange M bracket at approximately the 7 o'clock position. Remove the hose clamp from the forward end of the spray shield and remove the shield from the engine. Remove the lockwire and disconnect the tube nut from the tube coupling.
- Remove the lockwire and disconnect the tube elbow from the exhaust case internal tube nut at approximately the 10 o'clock position.
- Remove the bolts, nuts and clamps which hold the tube to Flange N and P brackets. Close the tube openings for protection.

- Remove the bolt, spacer, nut and clamp which holds the tube to the adjacent scavenge tube (LR05).

2 (Post SB PW4ENG 79-75 and Pre SB PW4ENG 79-76 only).
Disconnect and loosen the (rear) No. 4 bearing scavenge tube assembly (LR06) as follows :
(Ref. Fig. 532) (Sheet 5/6) and (Sheet 6/6)

- Remove hose clamp securing the tube shield to the bracket inboard side of Flange M at approximately the 7 o'clock position. Remove the hose clamp from the forward end of the spray shield and remove the shield from the engine. Remove the lockwire and disconnect the (LR05) hose and tube assembly nut from the (LR06) tube coupling.
- Remove lockwire and disconnect tube elbow from exhaust case internal tube nut at approximately the 10 o'clock position.
- Remove bolts, nuts and clamps securing tube to Flange N and P brackets. Close the tube openings for protection.
- Remove the bolt, spacer, nut, and clamp which holds the tube to the adjacent scavenge tube (LR05).

3 (Post SB PW4ENG 79-76) Disconnect and loosen the (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) tube assembly as follows :
(Ref. Fig. 533).

- Remove hose clamp securing the tube shield to the bracket inboard side of Flange M at approximately the 7 o'clock position. Remove the hose clamp from the forward end of the spray shield and remove the shield from the engine. Remove the lockwire and disconnect the (LR05) hose and tube assembly nut from the (LR21) tube coupling. See View DE.
- Remove lockwire and disconnect (LR22) tube elbow from exhaust case internal tube nut at approximately the 8:00 o'clock position. See View AP.
- Remove clamps, nuts and bolts that secure (LR21) and (LR22) tube assemblies. See Views A, B, C, D, F, O, Q and R.
- Close tube openings for protection.

4 Install PWA85843 Adapter into the tube coupling nut.

5 (Pre SB PW4ENG 79-76) Disconnect and loosen No. 4 bearing oil pressure tube (rear) (LP16) and remove No. 4 bearing strainer housing (Ref. Fig. 532).

- Remove the hose clamp which holds the spray shield to the rear tube connection on the exhaust case at approximately the 10:30 o'clock position.
  Remove the shield from the engine. Remove the lockwire and disconnect the tube nut from the strainer housing.
- Remove the lockwire and disconnect the strainer housing from the exhaust case internal tube nut at approximately the 10:30 o'clock position.
- Close the tube openings for protection.

6 (Post SB PW4ENG 79-76) Disconnect and loosen the No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) and remove the No. 4 bearing strainer housing (Ref. Fig. 533).

- Remove clamps and the tube spray shields at the (LP48) tube to the strainer housing connection, at the (LP47) tube to the (LP48) tube

connection and at the (LP47) tube to the (LP15) tube connection. See Views G, CA and LA.
- Remove clamps, bolts and nuts as shown in Views M, N, B1, P, R and F.
- Remove the (LP48) tube from the strainer housing and the (LP47) tube. See Views G and CA.
- Remove the element housing from the tube nut at approximately the 7 o'clock position. See View G.
- Remove the No. 4 bearing strainer element from the element housing. See View G.
- Remove and discard packing from the groove in the strainer element. See View G.
- Remove bolts and clamps. See Views U, T, and S.
- Remove the coupling nut that attaches (LP15) tube to the (LP47) tube. See View LA.

7 Install PWA85978 Plug into the coupling nut.

8 Attach the vacuum hose and the pressure line to the CTE 6075 Vacuum Cart.

9 Apply - 20 inches (-508.00 mm) Hg vacuum for test. Find the airflow leak rate into the no. 4 bearing compartment.

NOTE : During the vacuum test, and except as specified in this procedure, all oil supply tubes, breather tubes, and scavenge tubes must be installed. During the vacuum test gearbox covers for the integrated drive generator and both hydraulic pump pads must be installed.

10 Remove Adapter (PWA85843) from the coupling nut. Close the tube openings with standard shop fittings.

11 Remove the cover installed on the gearbox port. Install PWA85498 Adapter on the boss using the detail bolts. Install the adapter so that the larger threaded opening is pointed away from the engine. If the deoiler outlet tube is still attached use PWA 85845 Adapter. Attach the CTE 6075 vacuum Cart.

12 For this test set the vacuum pressure at PAMB minus 10 PSI (69 KPA), or PAMP minus 20 in. (508 mm) HG. At sea level this is 5.0 PSIA (34.5 KPA absolute).
Apply - 20 inches (-508.00 mm) Hg vacuum for test. Find the airflow leak rate into the 1, 1.5, 2, 3 bearing compartment and the angle gearbox.

13 Remove Adapter (PWA 85845 or PWA 85498) and remove Plug (PWA 85978).

14 (Pre SB PW4ENG 79-76) Install the No. 4 bearing strainer housing and the No. 4 bearing oil pressure tube assembly (LP16) (Ref. Fig. 532).
- Install the strainer, housing, threads lubricated with Engine Oil (Material No.P03-001), to the exhaust case internal tube nut at approximately the 10:30 o'clock position, tighten by hand.
- Install the (LP 16) No. 4 bearing oil pressure tube assembly to the strainer housing. Install the tube, threads lubricated with Engine Oil (Material No.P03-001), to the strainer housing on the exhaust case, tighten by hand.

15 (Post SB PW4ENG 79-76) Install the No. 4 bearing strainer housing and the No. 4 bearing oil pressure tube assemblies (LP47) and (LP48) which replace (LP16) as follows. Also install the No. 4 bearing strainer

element, if applicable, as follows : (Ref. Fig. 533).
- Install the strainer housing, threads lubricated with Engine Oil (Material No.P03-001) to the exhaust case internal tube nut at approximately the 7:00 o'clock position, tighten by hand.
- Attach the coupling nut on the (LP15) tube to the (LP47) tube, handtight only. See View LA.
- Install clamps and secure with bolts. See Views U, T and S.
- Install packing, lubricated with Engine Oil (Material No.P03-001) to the groove in the No. 4 bearing strainer element. See View G.
- Install the No. 4 bearing strainer element into the No. 4 bearing strainer element housing, handtight only. Lubricate threads with Engine Oil (Material No.P03-001). See View G.
- Install the element housing, lubricated with Engine Oil (Material No.P03-001), on to the tube nut at approximately the 7 o'clock position, handtight only. See View G.
- Attach the (LP48) tube to the strainer housing and the (LP47) tube, handtight only. See Views G and CA.
- Install clamps and secure with bolts and nuts as necessary. See Views M, N, B1, P, R and F.
- TORQUE the strainer to the strainer housing to between 150 and 170 lbf.in. (1.7 and 1.92 m.daN). Safety whith Lockwire (Material No.P05-289) or Safety Cable (Material No. P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the internal tube nut to the strainer housing to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the (LP48) tube to the strainer housing to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the (LP48) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the (LP15) tube to the (LP47) tube to between 340 and 375 lbf.in. (3.84 and 4.23 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE all the installed clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

16 (Post SB PW4ENG 79-76) Install the shields for the No. 4 bearing oil pressure lines as follows :
- Install shield at the (LP47) tube to the (LP15) tube connection. Secure shield with clamps. See View LA.
- Install shield at the (LP47) tube to the (LP48) tube connection. Secure shield with clamps. See View CA.
- Install shield at the (LP48) tube to the strainer housing connection. Secure shield with clamps. See View G.
- Torque all clamps to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

17 (Pre SB PW4ENG 79-75) Connect and clamp the (LR06) No. 4 bearing oil scavenge tube assembly (Ref. Fig. 532) (Sheet 1/6) through (Sheet 4/6).
- Remove protection and install tube elbow with nut threads lubricated with Antiseize Compound (Material No.P06-054), to the exhaust case internal tube nut at approximately the 10 o'clock position, and to the tube coupling forward of Flange M at approximately the 7 o'clock position, tighten by hand.
- Install the clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001), and nuts which hold the tube to Flange N and P brackets. TORQUE the clamp bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
- Install the clamp, bolt, threads lubricated with Engine Oil (Material No.P03-001), spacer, and nuts to hold the (LR06) tube to the adjacent (LP16) No. 4 bearing oil pressure tube assembly.
- TORQUE the tube nut at the exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the tube nut at Flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Install Lockwire (Material No. P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- (Ref. 75-23-07, P. Block 401). Install the spray shield to the inboard side of Flange N connection and attach the forward end of the shield with a hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
- Secure the clamp to the rear end of the shield and Flange M bracket with a bolt, threads lubricated with Engine Oil (Material No. P03-001), and nut.
  TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

18 (Pre SB PW4ENG 79-76) Torque the (LP16) No. 4 bearing oil pressure tube nut to the strainer housing. TORQUE the tube nut to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

19 (Pre SB PW4ENG 79-76) TORQUE the exhaust case internal tube nut to the last chance strainer housing to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

20 (Pre SB PW4ENG 79-76) (Ref. 75-23-07, P. Block 401). Install the spray shields to the inboard side of the front and rear connections and attach with hose clamps.
TORQUE the hose clamps to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

21 (Post SB PW4ENG 79-75 and Pre SB PW4ENG 79-76 only) Install (rear) No. 4 bearing scavenge tube assembly (LR06) as follows :
(Ref. Fig. 532) (Sheet 5/6) and (Sheet 6/6).
- Install rear scavenge tube, threads lubricated with Antiseize Compound (Material No.P06-054), to exhaust case internal tube nut

at approximately 10 o'clock position, and to the tube (LR05) coupling forward of Flange M at approximately 7 o'clock position, handtight only.
- Install loop clamp bracket on Flange M bracket at approximately 7 o'clock with bolts lubricated with Engine Oil (Material No. P03-001), handtight only. TORQUE bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- Secure tube to loop clamp bracket on Flange M bracket with one clamp and bolt, lubricated with Engine Oil (Material No.P03-001), handtight only. TORQUE clamp bolt to between 27 and 30 lbf.in. (0.30 and 0.33 m.daN).
- Install clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001) and nuts securing tube to Flange N and P brackets. TORQUE clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- TORQUE tube nut at exhaust case connection to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN). Secure with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE tube nut at Flange N connection to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Secure with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- Position tube shield to inboard side of Flange M connection and secure forward end of shield with hose clamp. TORQUE hose clamp to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).

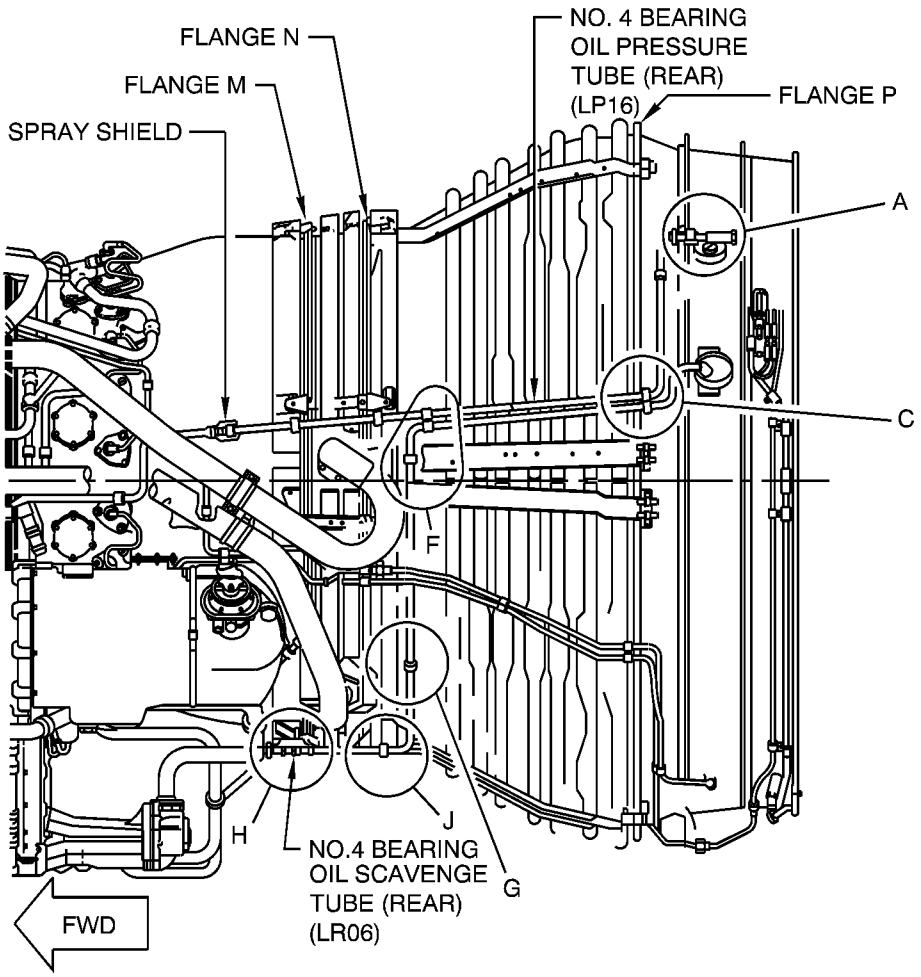
22 (Post SB PW4ENG 79-76) Install (rear) No. 4 bearing scavenge tube assemblies (LR21) and (LR22) which replace (LR06) as follows :
- Attach the (LR21) tube to the (LR05) tube handtight only (Ref. Fig. 533) (Sheet 4/11). View DE.
- Install clamps and secure with nuts and bolts, handtight only. (Ref. Fig. 533) (Sheet (5/11), Views O and Q and (Sheet 6/11), Views F and R.
- Attach the (LR22) tube to the (LR21) tube and the port for the internal tube on the turbine exhaust case, handtight only. Lubricate the threads that are on the internal tube with Engine Oil (Material No.P03-001).
(Ref. Fig. 533) (Sheet 7/11), Views E and AP.
- Install clamps on the (LR22) tube and secure with bolts, handtight only. (Ref. Fig. 533) (Sheet 8/11), Views A, B, C and D.
- TORQUE the (LR21) tube to the (LR05) tube to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the (LR21) tube to the (LR22) tube to between 475 and 525 lbf.in. (5.37 and 5.93 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No. P05-291) and Safety Cable Ferrule (Material No.P05-292).
- TORQUE the internal tube nut to the (LR22) tube to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN). Safety with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable

Ferrule (Material No.P05-292).

23 (Post SB PW4ENG 79-76) Install the shields for the No. 4 bearing oil scavenge lines as follows :

- Install shield at the (LR05) tube to the (LR21) tube connection. Secure shield with clamp or bolt as applicable. (Ref. Fig. 533) (Sheet 4/11), View DE.
- Install shield at the (LR21) tube to the (LR22) tube connection. Secure shield with clamp or bolt as applicable (Ref. Fig. 533) (Sheet 7/11), View E.
- TORQUE the clamps to between 15 and 18 lbf.in. (0.17 and 0.20 m.daN).
- TORQUE the nut and bolt to between 36 and 40 (0.41 and 0.45 m.daN).

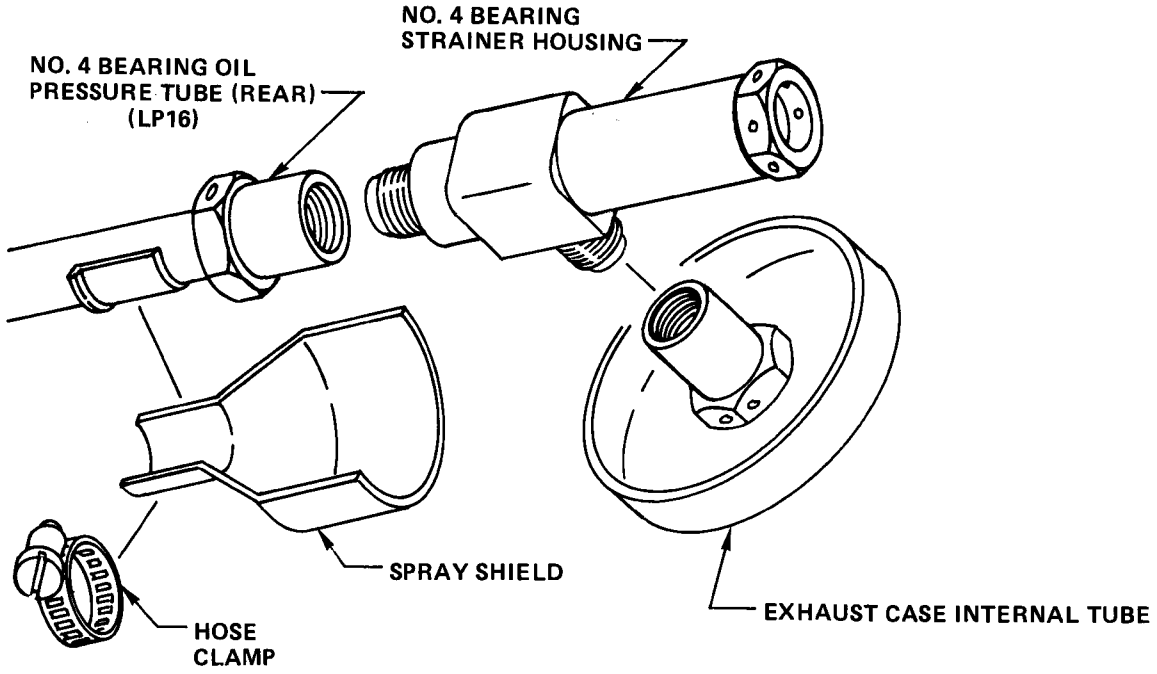
24 Refer to the Test Reference Table.



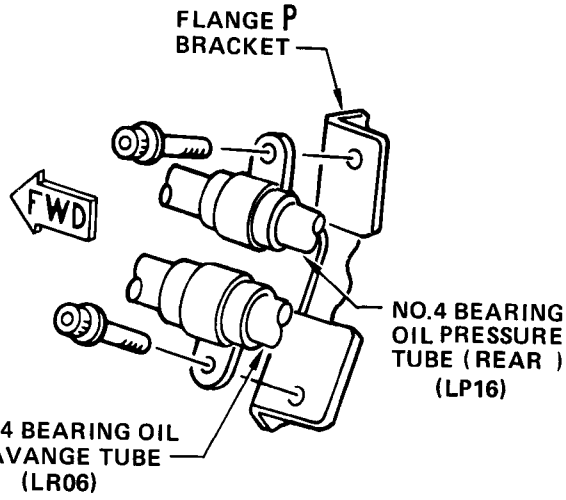
BM5 71 00 00 5 KNLA 01

L-A6120 (0000)
PW V

Engine Vacuum Test (Pre SB PW4ENG 79-75)
(Sheet 1/6)
Figure 532



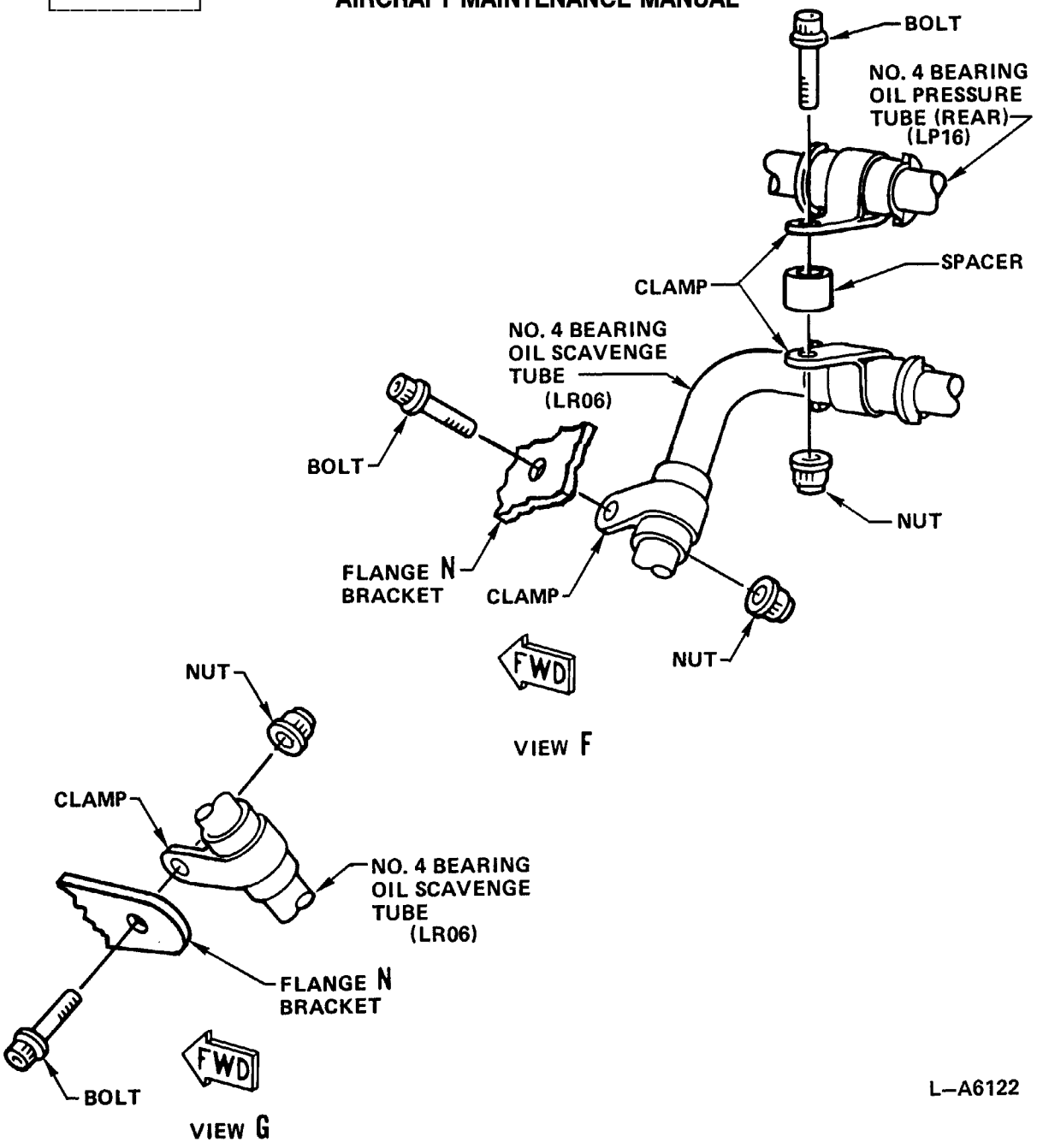
VIEW A



VIEW C L—A6121

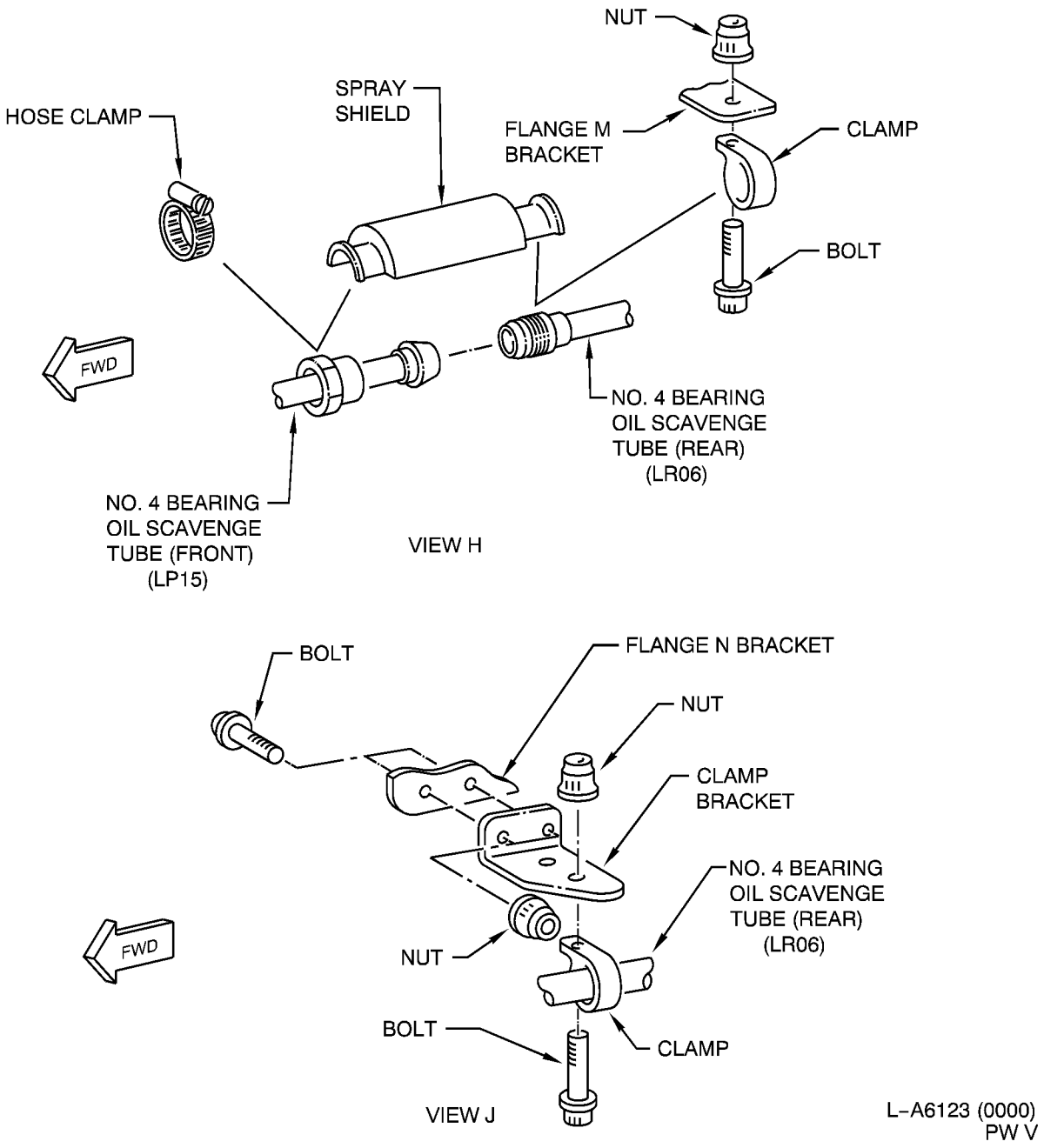
BM5 71 00 00 5 KNLC 01

Engine Vacuum Test (Pre SB PW4ENG 79-76)
(Sheet 2/6)
Figure 532

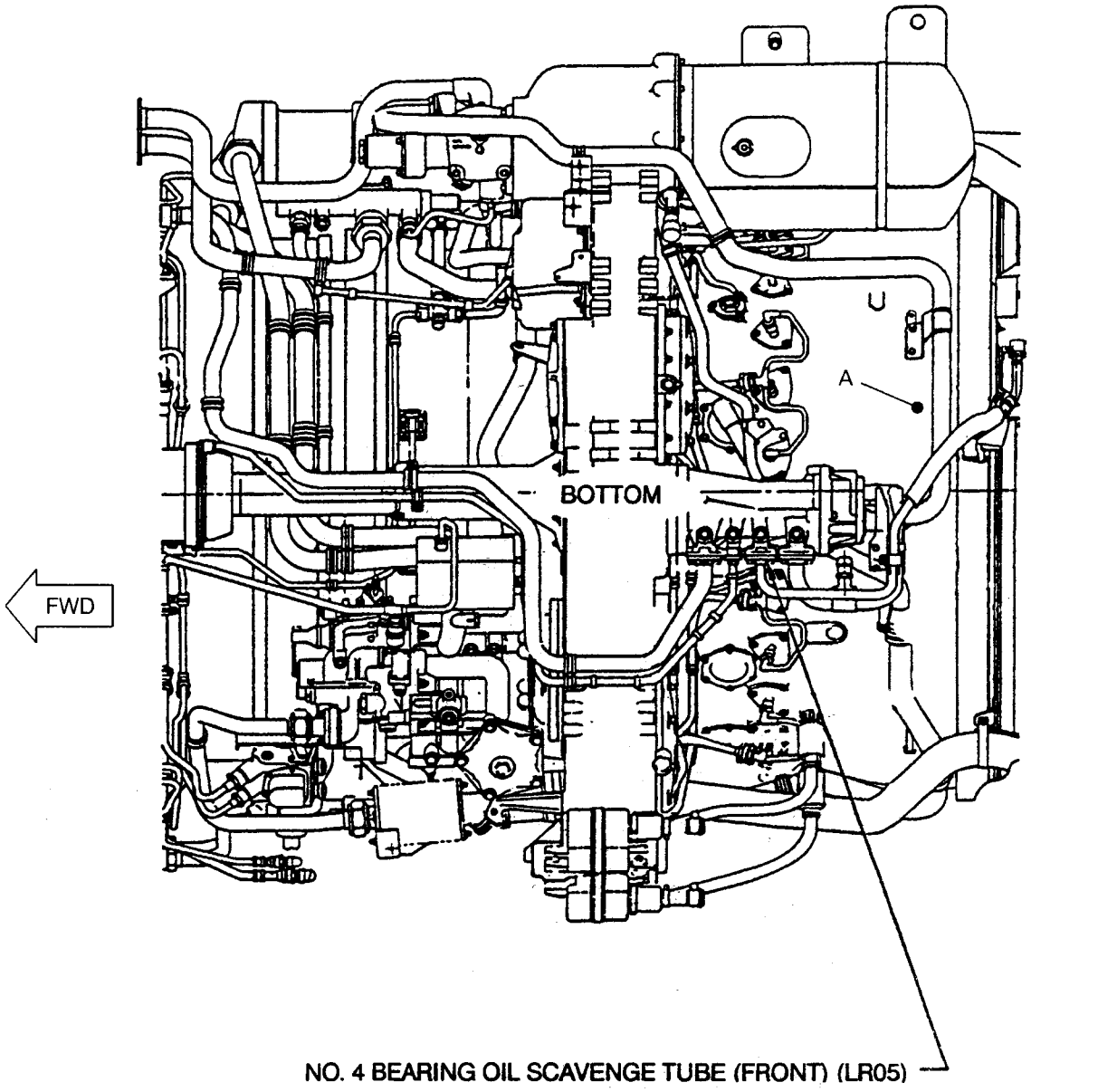


BM5 71 00 00 5 KNLE-00

Engine Vacuum Test (Sheet 3/6)
Figure 532



Engine Vacuum Test (Sheet 4/6)
Figure 532



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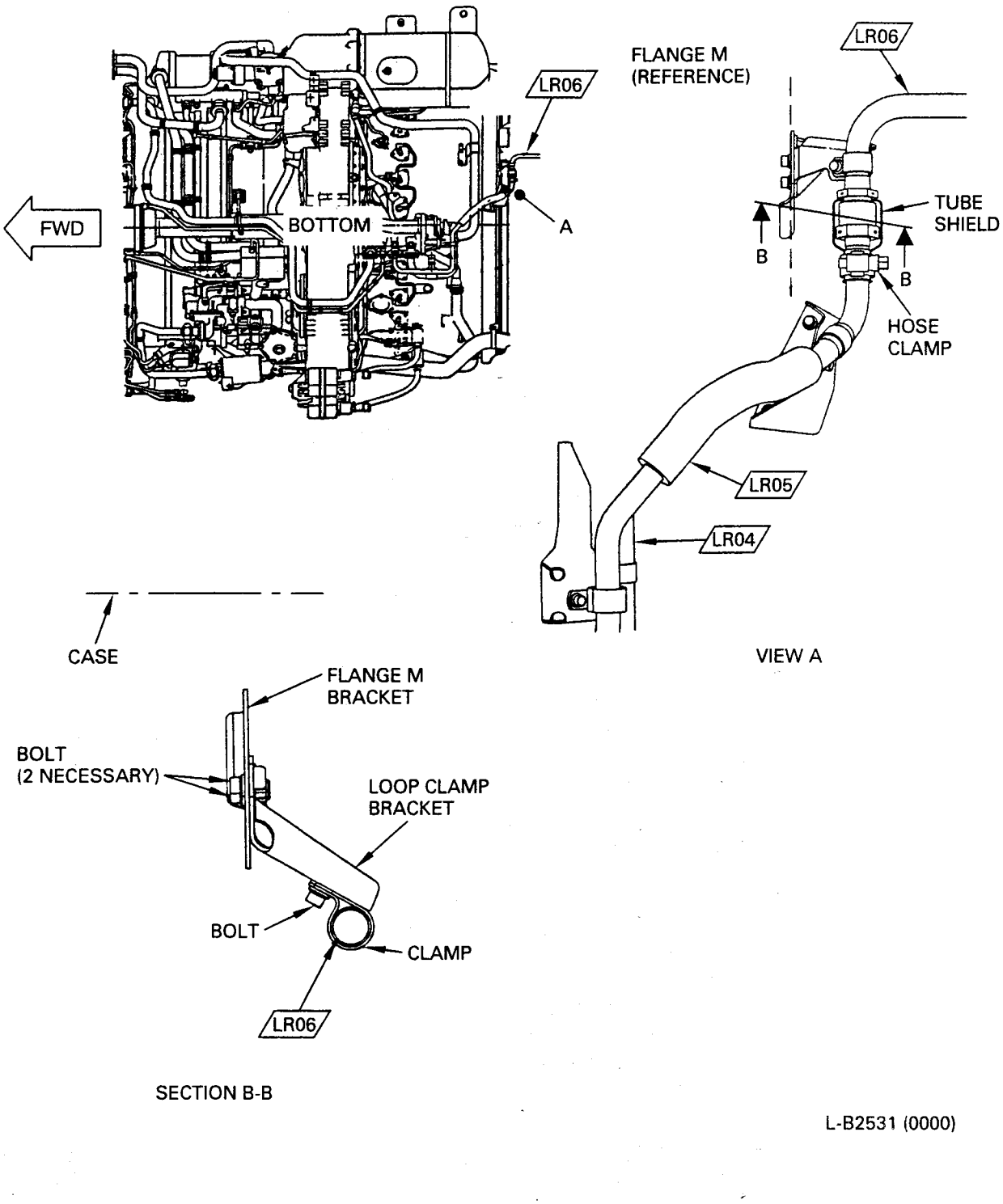
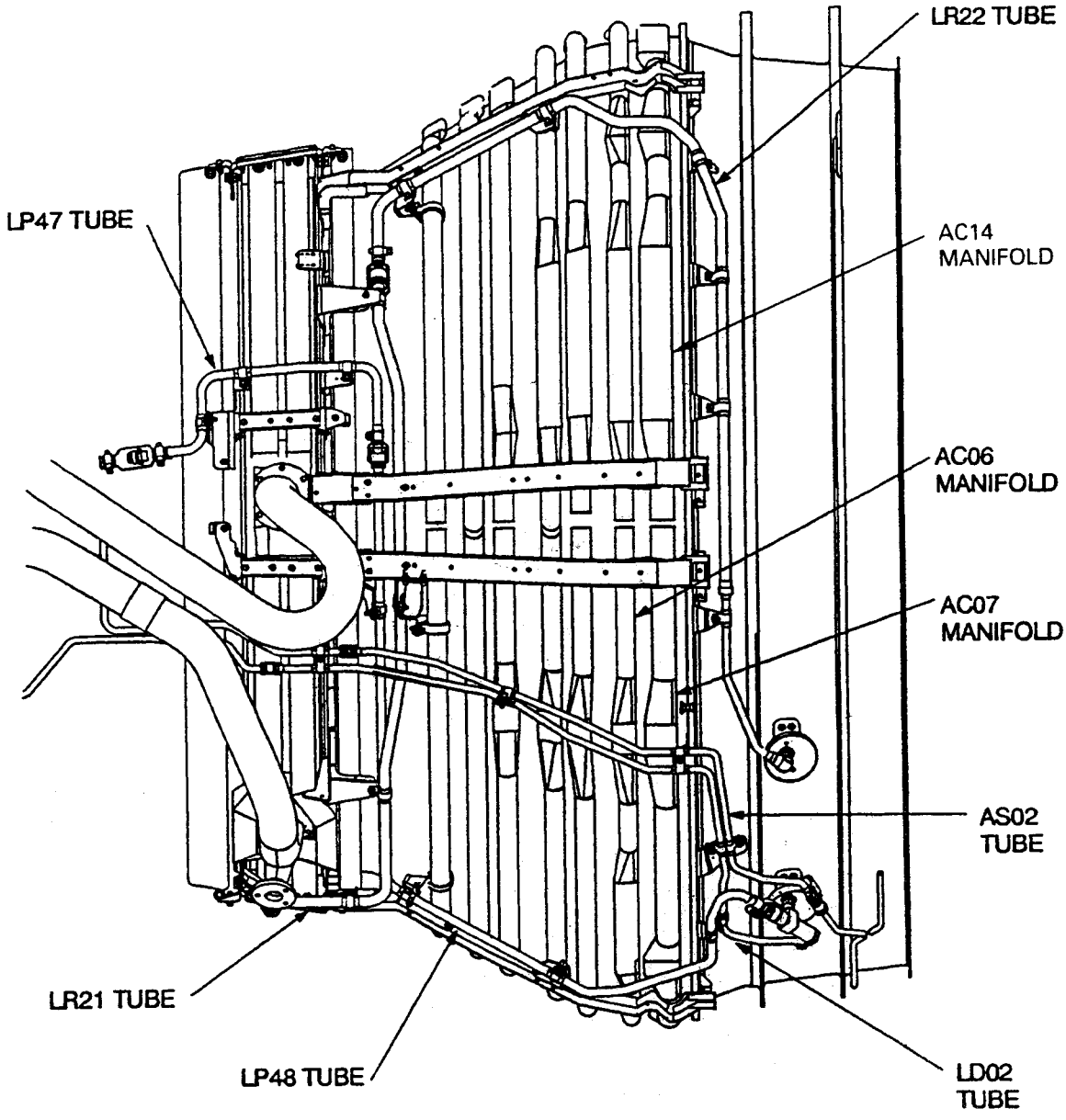
BM5 71 00 00 5 KNLJ 00

Engine Vacuum Test (Post SB PW4ENG 79-75)
(Pre SB PW4ENG 79-76) (Sheet 5/6)
Figure 532



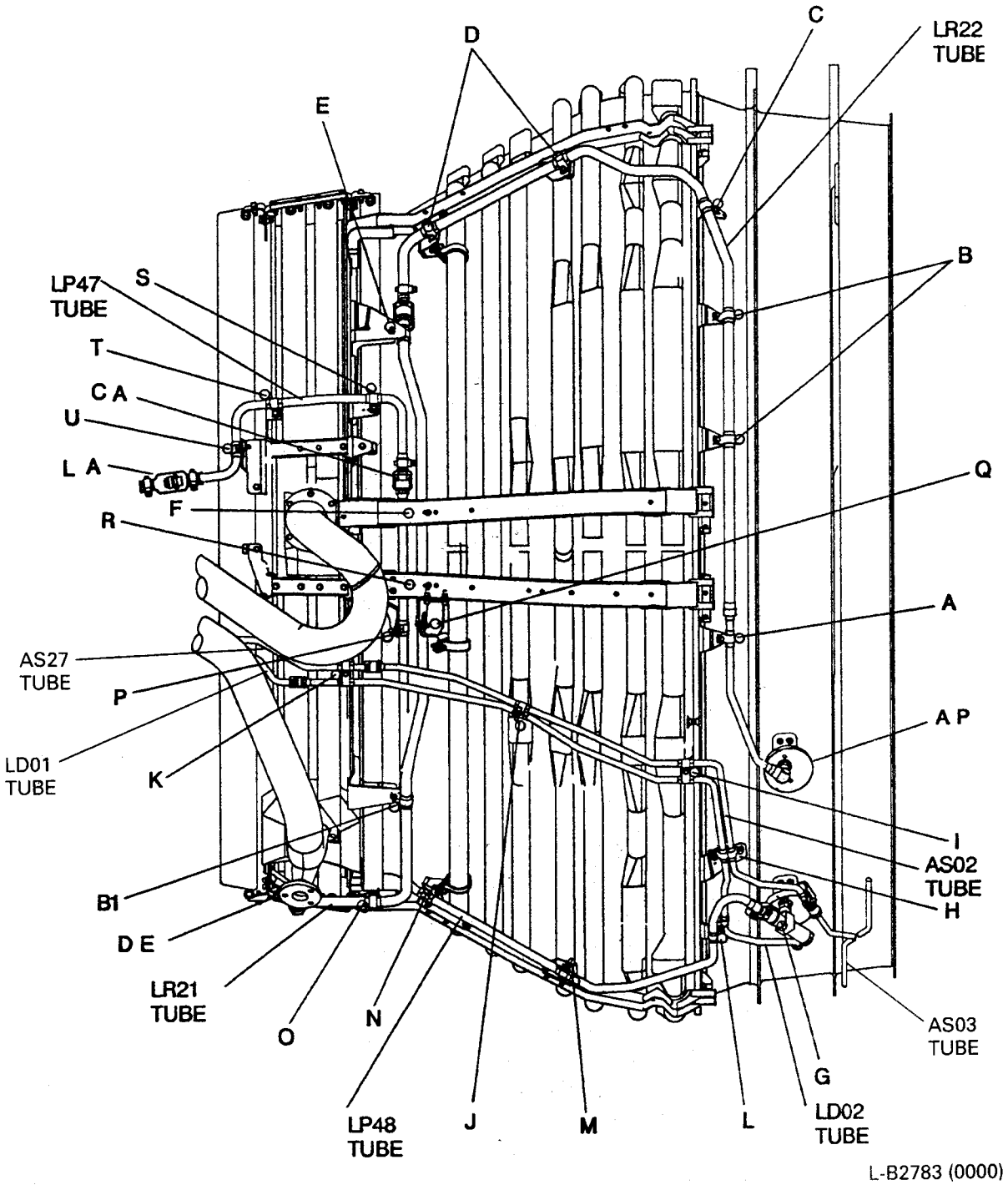
BM5 71 00 00 5 KNLL 00

Engine Vacuum Test (Post SB PW4ENG 79-75)
(Sheet 6/6)
Figure 532



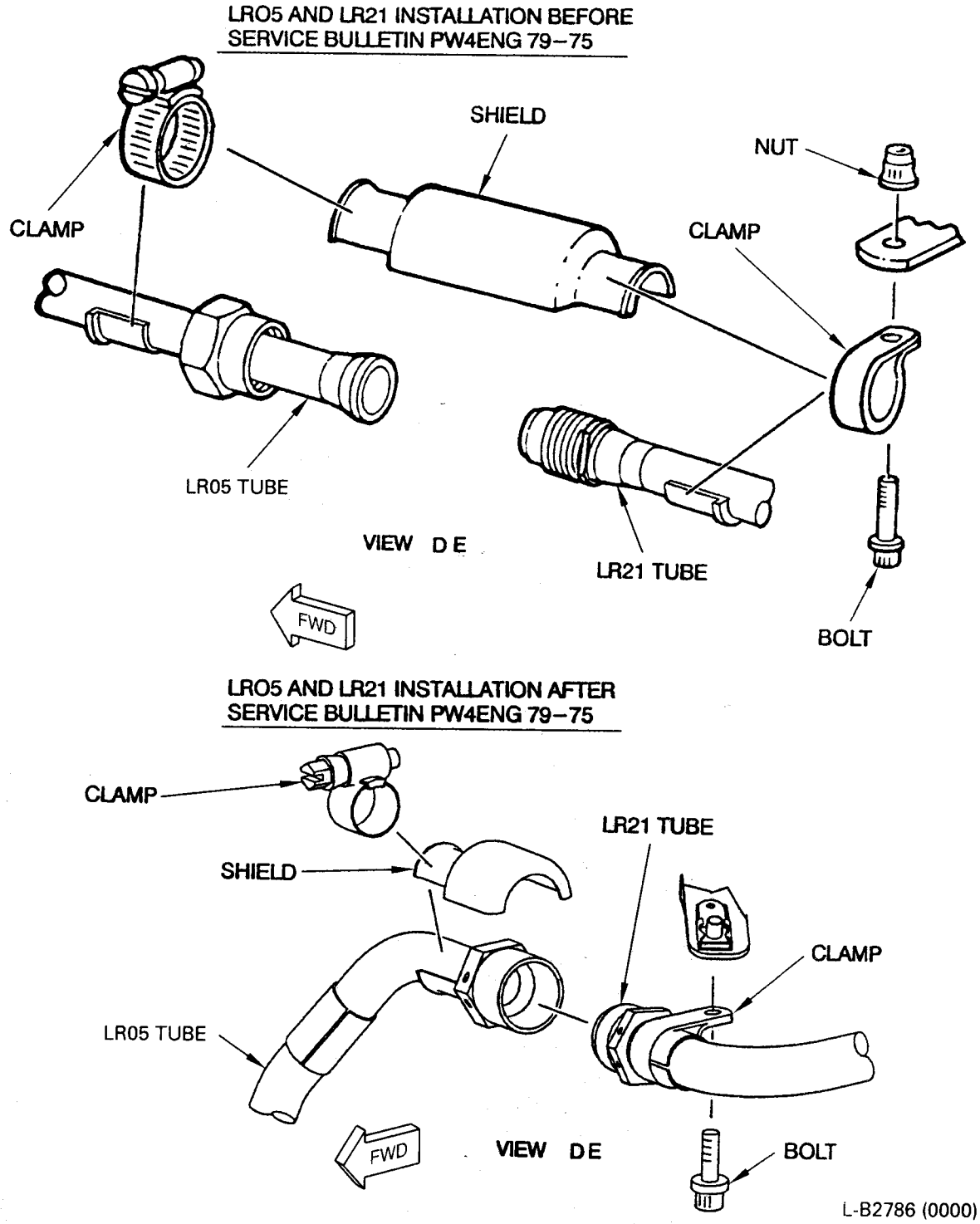
BM5 71 00 00 5 KPLA 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 1/11)
Figure 533



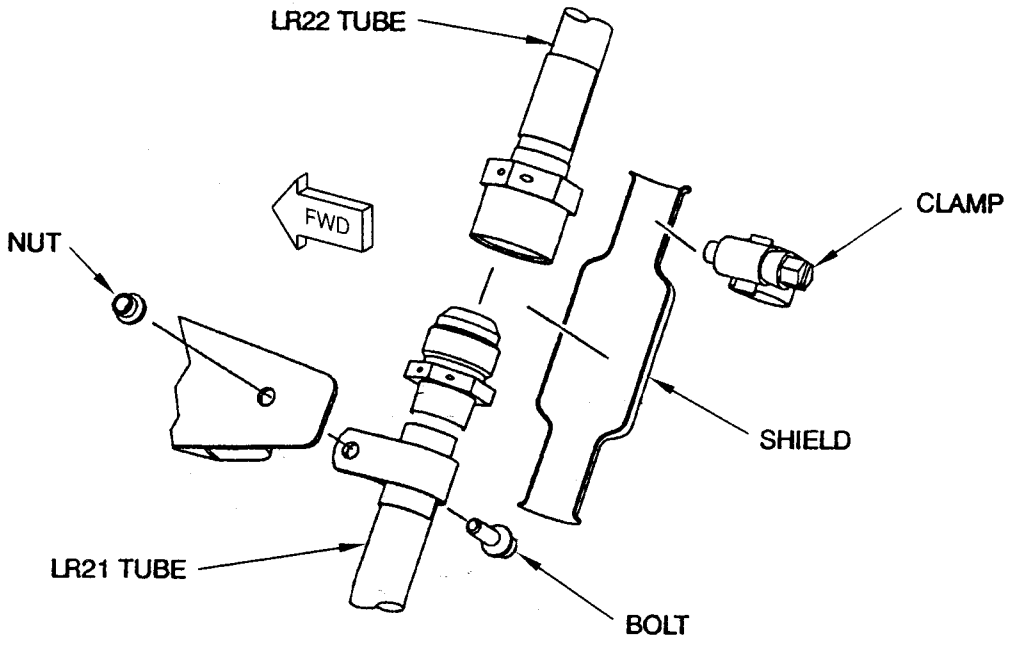
BM5 71 00 00 5 KPLC 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 2/11)
Figure 533

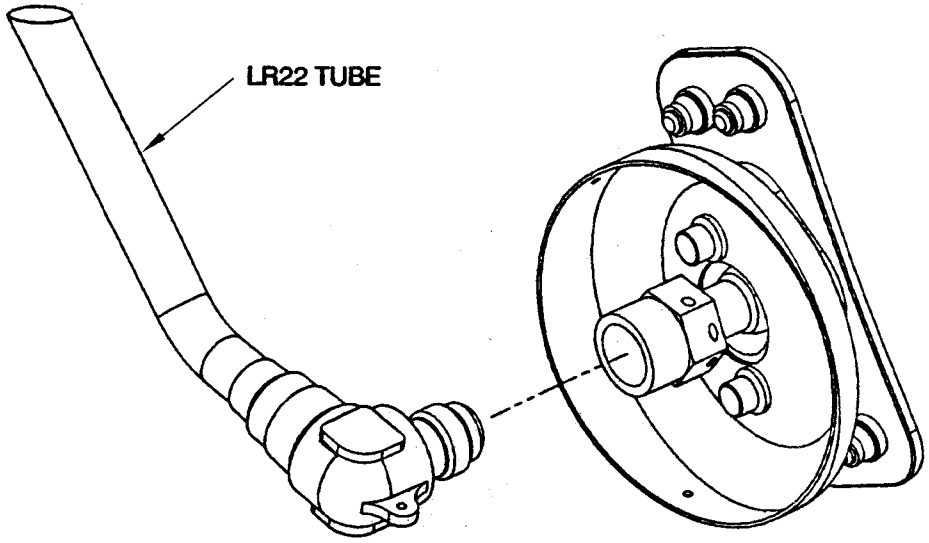


BM5 71 00 00 5 KPLE 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 3/11)
Figure 533



VIEW E

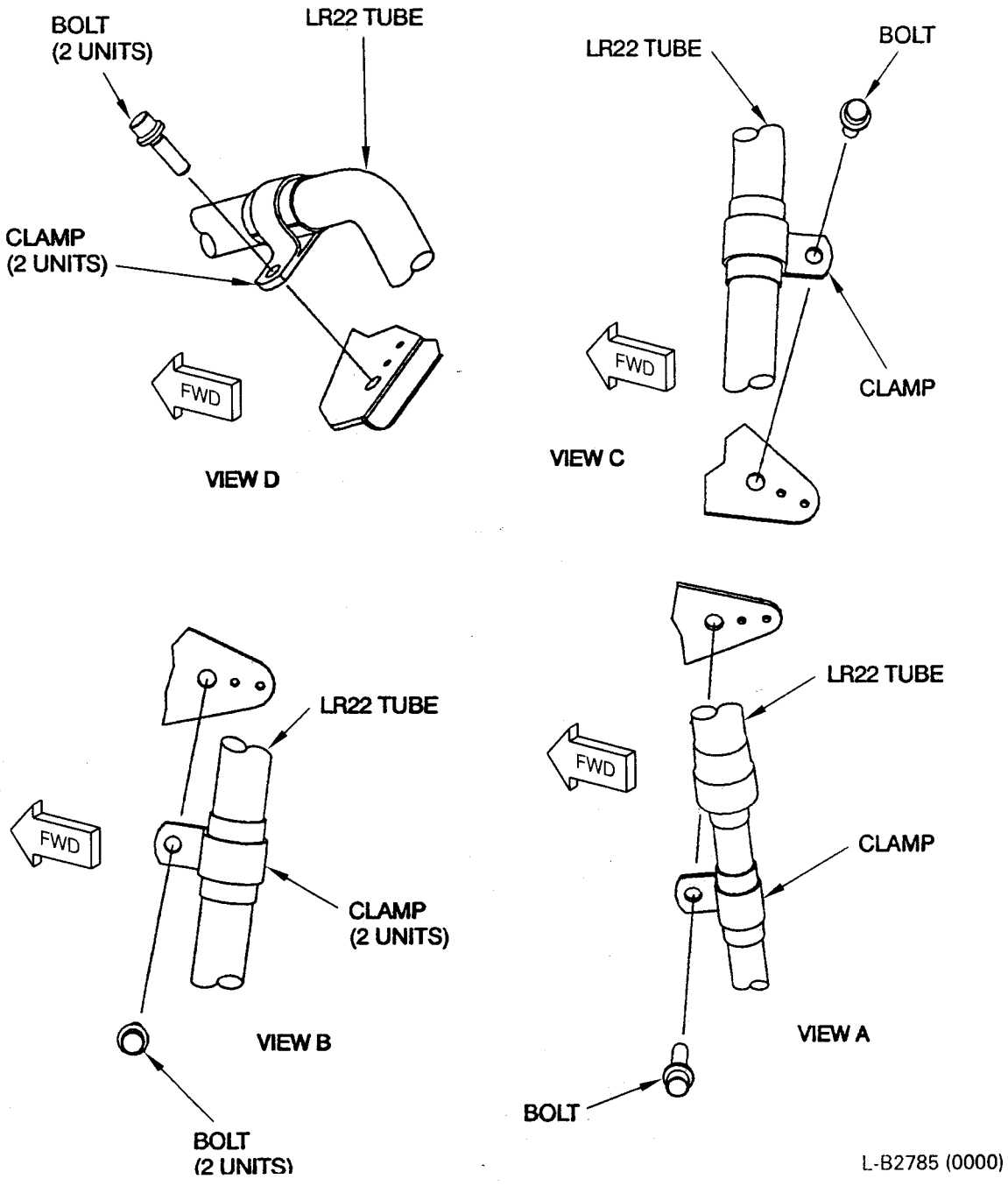


VIEW A P

L-B2784 (0000)

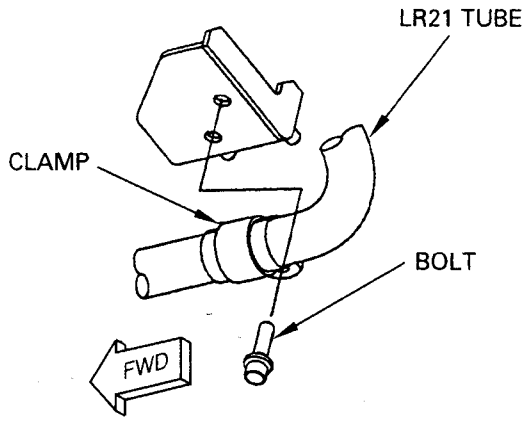
BM5 71 00 00 5 KPLG 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 4/11)
Figure 533

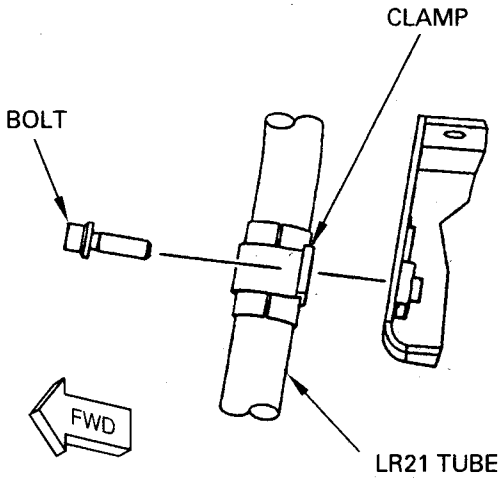


BM5 71 00 00 5 KPLJ 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 5/11)
Figure 533



VIEW O

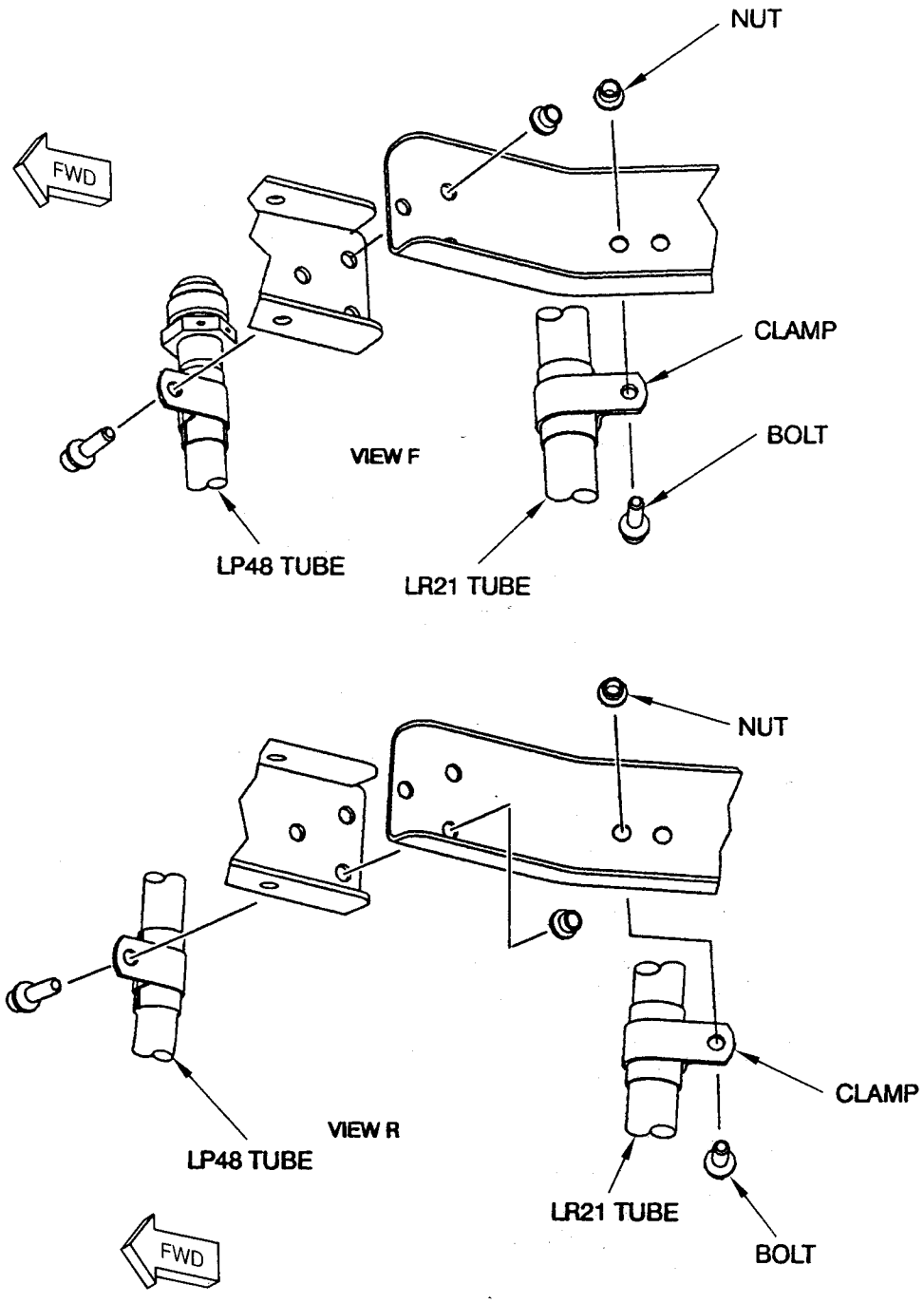


VIEW Q

BM5 71 00 00 5 KPLL 00

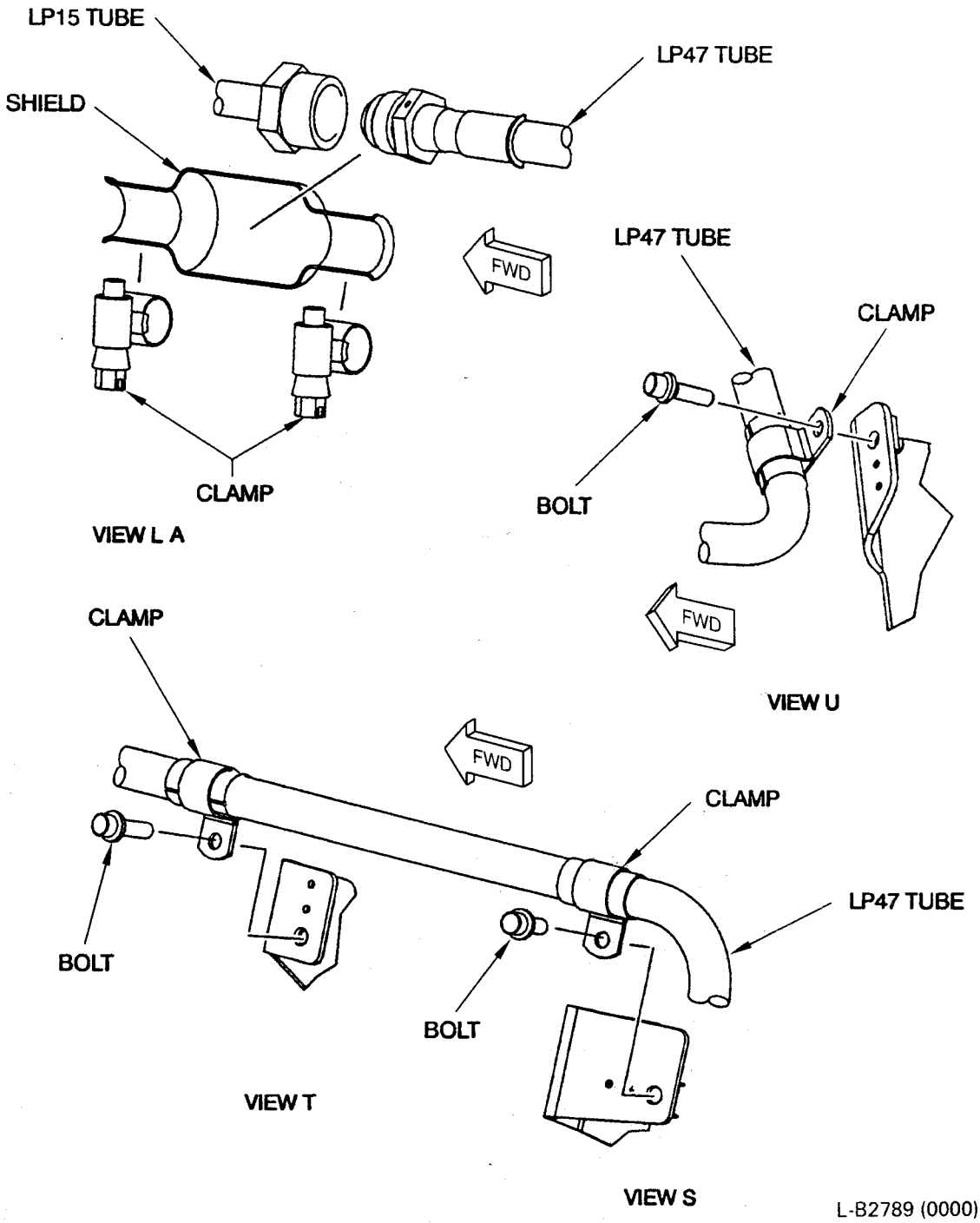
L-B2787 (0000)

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 6/11)
Figure 533



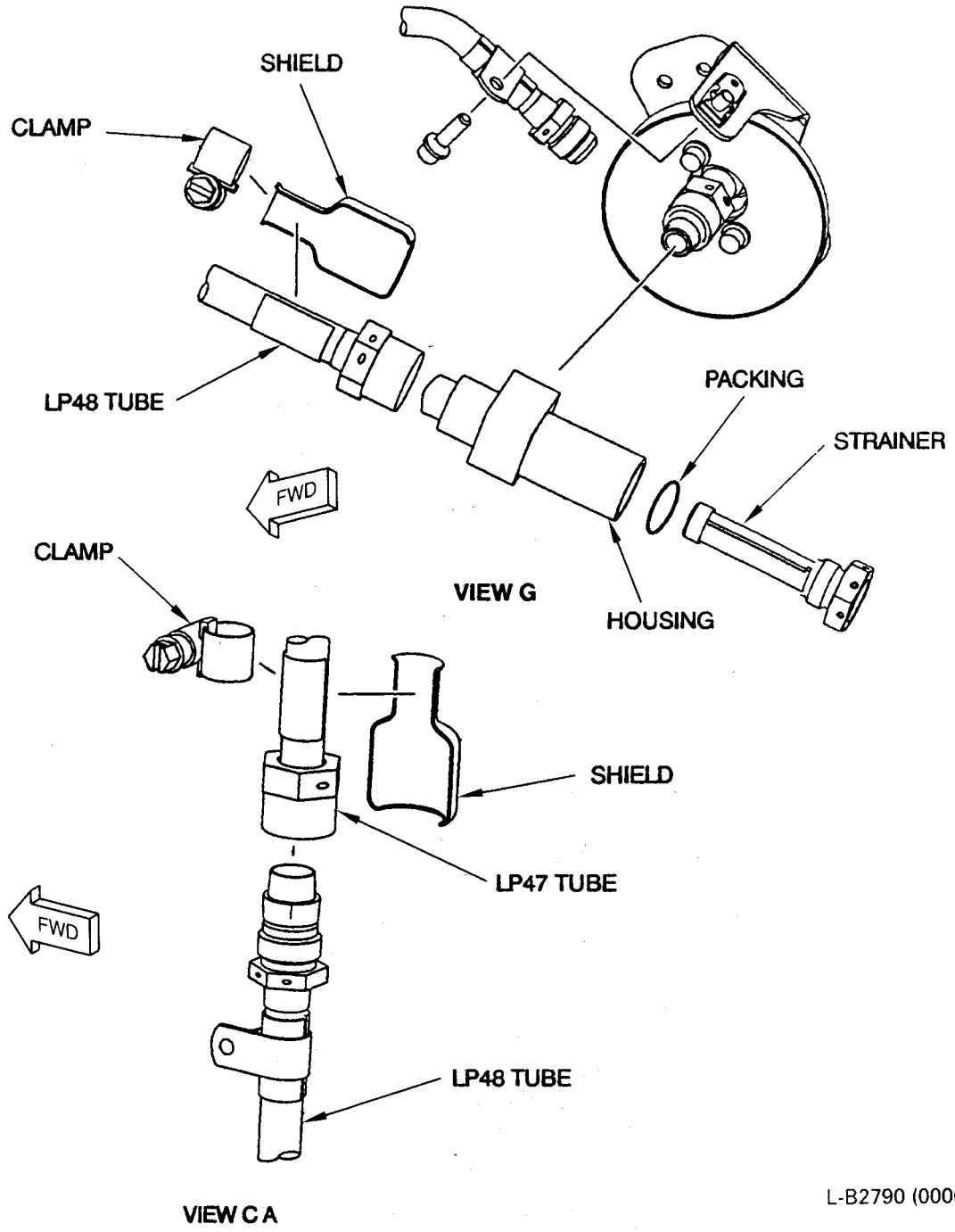
BM5 71 00 00 5 KPLN 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 7/11)
Figure 533



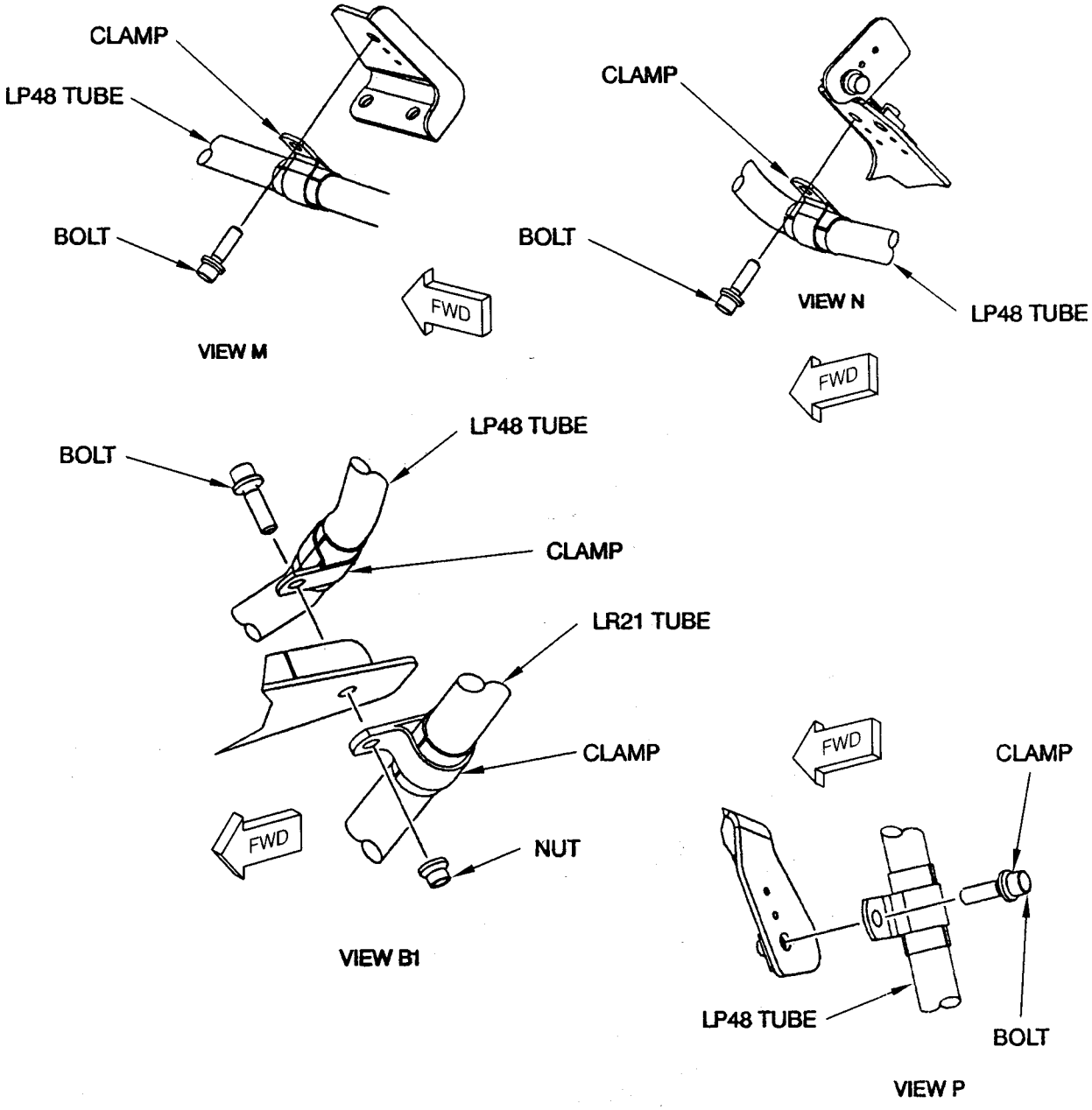
BM5 71 00 00 5 KPLP 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 8/11)
Figure 533



BM5 71 00 00 5 KPLR 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 9/11)
Figure 533



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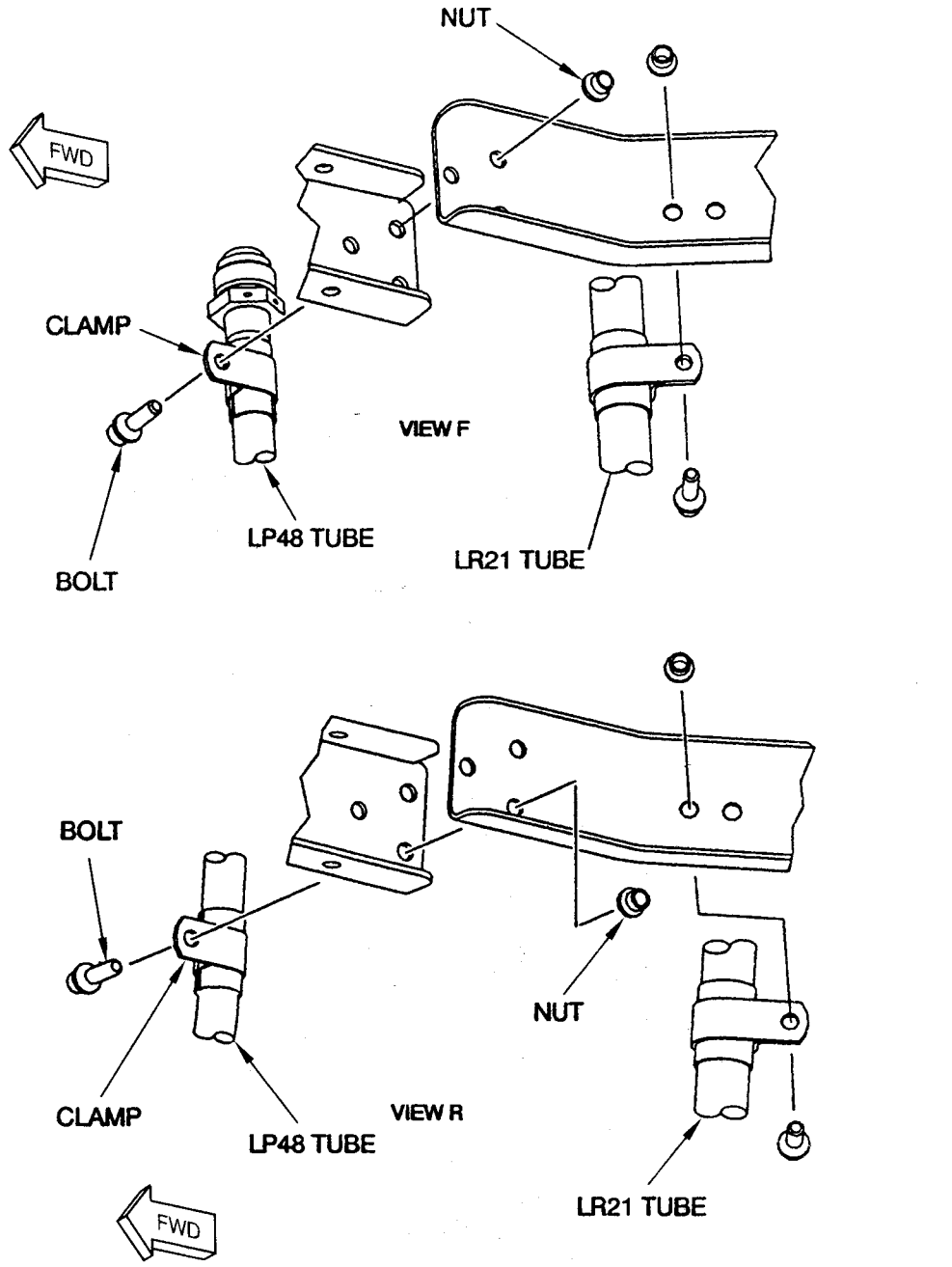
BM5 71 00 00 5 KPLT 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 10/11)
Figure 533



BM5 71 00 00 5 KPLV 00

Engine Vacuum Test (Post SB PW4ENG 79-76)
(Sheet 11/11)
Figure 533

W. Test No. 13 - Main Oil Pressure

(1)General

(a)This procedure provides a test for monitoring and adjusting engine main oil pressure.

(b)Acceptable main oil pressure readings at high rotor speeds (N2) are provided in this procedure.

(c)Main oil pressure readinge not within specified limits must be adjusted by replacing the external oil tube metering nipple with one of a different class.

(2)Equipment and materials

ITEM	DESIGNATION
(a)Material No.P05-289	Special Materials (Ref. 70-00-00)
(b)Material No.P05-291	Special Materials (Ref. 70-00-00)
(c)Material No.P05-292	Special Materials (Ref. 70-00-00)
(d)Material No.P06-021	Lubricants (Ref. 70-00-00)
(e)	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
(f)	Circuit Breaker Safety Clips
Referenced Procedure	
- 71-00-00, P. Block 201	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

(3)Test procedure

WARNING : BEFORE STARTING ONE OR BOTH ENGINES ALL SAFETY AND OPERATING PRECAUTIONS MUST BE OBSERVED TO IMMOBILIZE AIRCRAFT (REF. 2.E.).

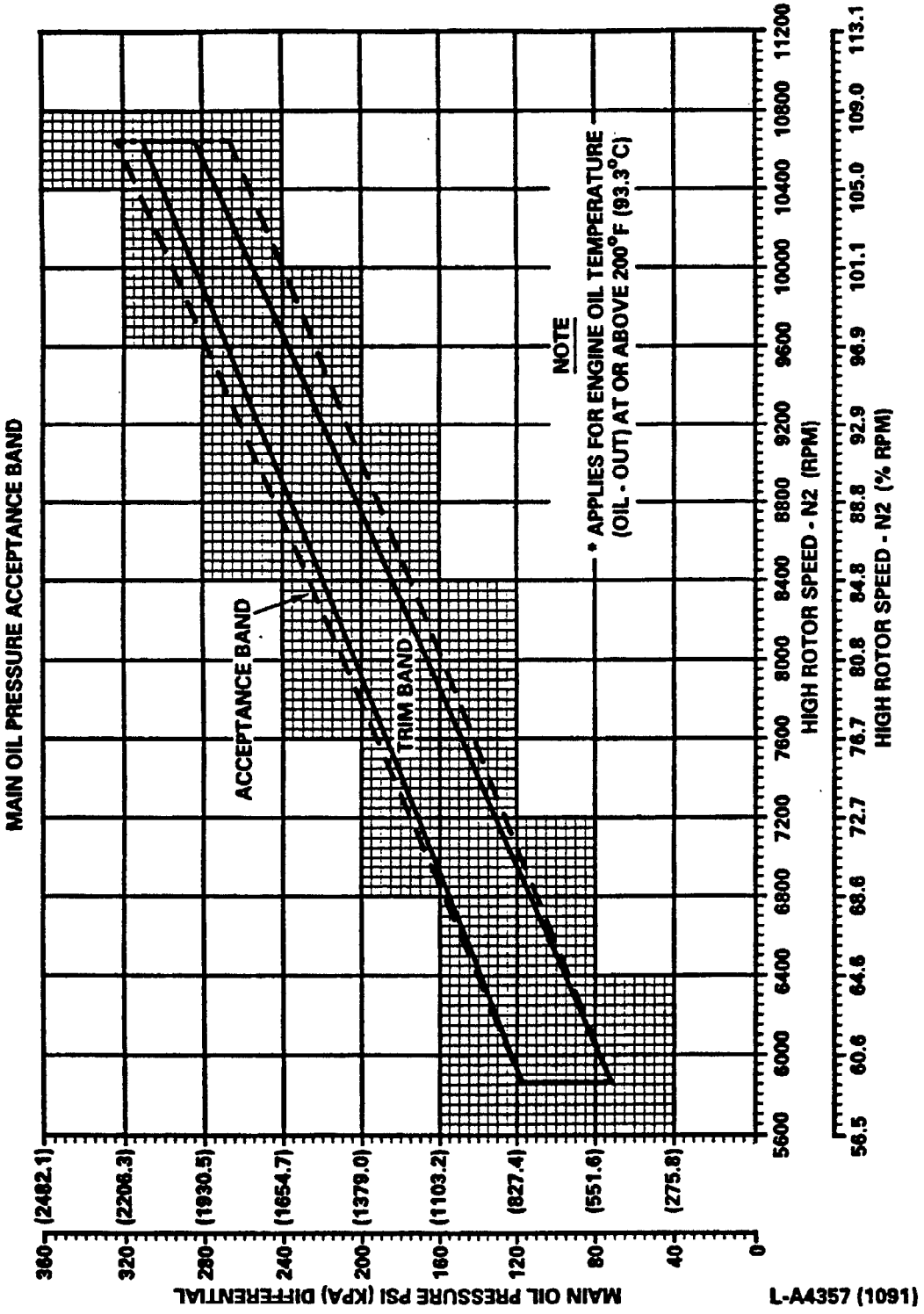
(a)Make certain that there are no leaks (Ref. TEST No. 3 Para. 5. G. prior to testing for main oil pressure).

NOTE : During visual inspection of oil tubes for condition, security and leakage, very small amount of oil wetness might be observed on variable vane arm retention bolts near the bottom of the engine, or in the nose cone/spinner. The source of this oil has been identified as the No. 2 Bearing Carbon Seal Assembly. It is normal,especially following engine windmilling or an extended start sequence, that a small amount of oil would seep past the No. 2 Bearing Carbon Seal Assembly and then accumulate, after engine shutdown, on the variable vane arm retention bolts. This amount of oil seepage is an acceptable and normal condition and is not cause to remove the engine from service as long as other inspection criteria for oil leaks from engine oil tubes are met.

R (b)Obey the safety and operating precautions as described in Paragraph 2.
R (Ref. 71-00-00, P. Block 501)
R (c)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.
R (d)There must be two qualified persons in the cockpit when performing
R an engine run above idle. One must monitor the outside and the

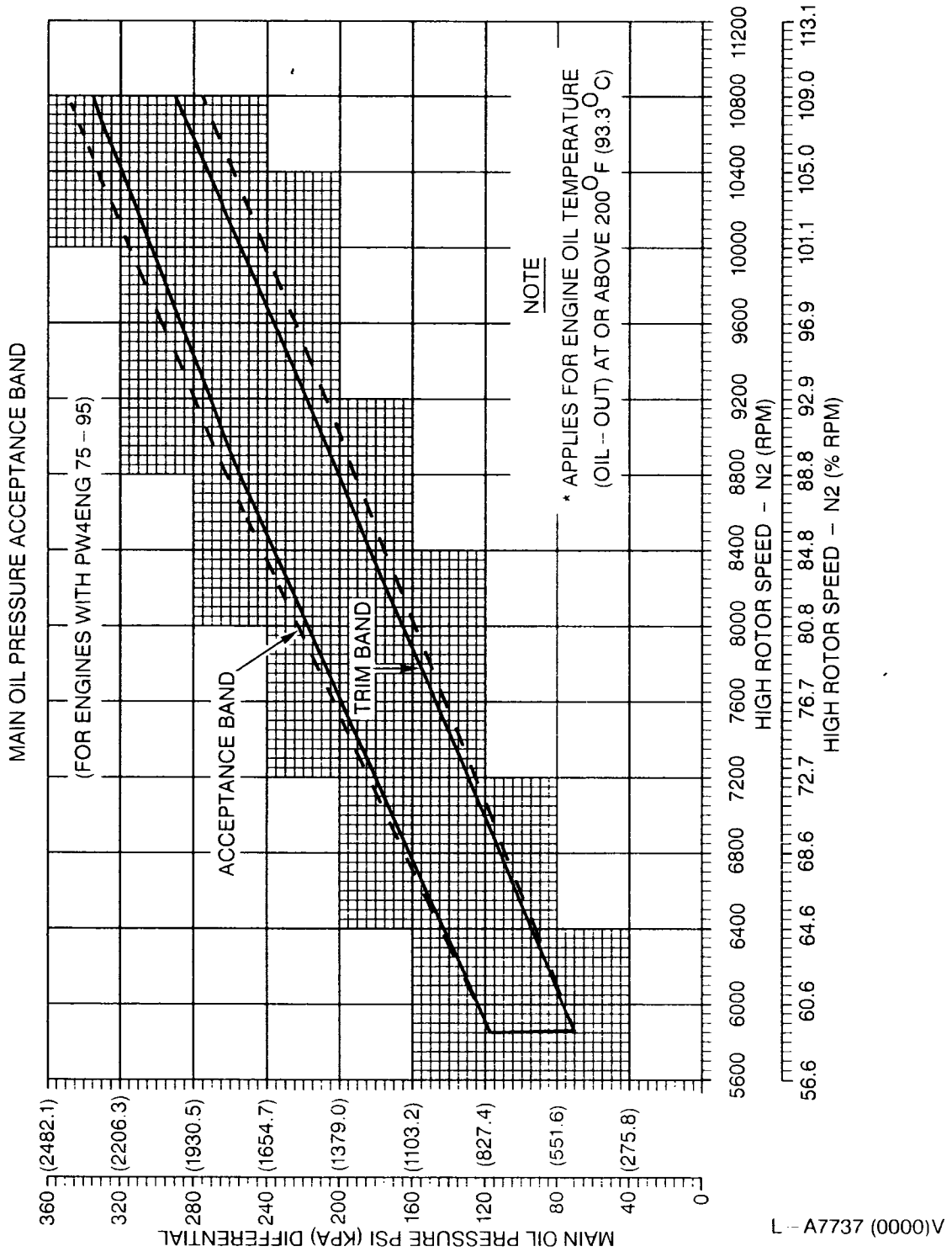
R aircraft behaviour while the other performs the engine test.
R (e)If the aircaft begins to move while performing an engine run, immediately set all the thrust levers to idle position.
R (f)Prepare, service, and start engine as described in 71-00-00, P. Block 201.
R (g)Allow engine to stabilize at **MINIMUM IDLE** N2 rpm for five minutes.
R (h)Check that operating indications are within operating limits (Ref. 71-00-00, P. Block 201). Record percent N2 rpm and ECAM oil pressure.
R (j)Slowly advance throttle control lever to 1.3 EPR position and allow engine to stabilize. Record percent N2 rpm, and ECAM "oil pressure".
R (k)Slowly advance throttle control lever to 1.4 EPR position and allow engine to stabilize for 15-20 seconds. Record percent N2 rpm, and ECAM "oil pressure".
R (l)Slowly retard throttle control lever to **MINIMUM IDLE** and operate engine for five minutes for cool down.
R (m)After five minutes at **MINIMUM IDLE**, shutdown engine (Ref. 71-00-00, P. Block 201).
R (n)Verify main oil pressure readings are within specified limits (Ref. Fig. 534, 535).
1 If oil pressure readings are not within specified limits comply with the following :
- for engines Pre Service Bulletin PW 4 ENG-72-114 select new class oil tube metering nipple. (Ref. Fig. 536) and (Ref. Table 508).
- for engines Post Service Bulletin PW 4 ENG-72-114 select new class oil tube metering nipple. (Ref. Fig. 537) and (Ref. Table 508).

PART NUMBER	ORIFICE DIAMETER
52T955 CL1	over 0.099 - 0.101 in. (over 2.515 - 2.565 mm)
52T955 CL2	over 0.104 - 0.106 in. (over 2.642 - 2.692 mm)
52T955 CL3	over 0.109 - 0.111 in. (over 2.769 - 2.819 mm)
52T955 CL4	over 0.114 - 0.116 in. (over 2.895 - 2.946 mm)
52T955 CL5	over 0.119 - 0.121 in. (over 3.023 - 3.073 mm)
52T955 CL7	over 0.123 - 0.125 in. (over 3.124 - 3.175 mm)
52T955 CL8	over 0.125 - 0.127 in. (over 3.175 - 3.226 mm)
52T955 CL9	over 0.127 - 0.129 in. (over 3.226 - 3.277 mm)
52T955 CL10	over 0.129 - 0.131 in. (over 3.276 - 3.327 mm)
52T955 CL11	over 0.131 - 0.133 in. (over 3.327 - 3.378 mm)
52T955 CL13	over 0.135 - 0.137 in. (over 3.429 - 3.480 mm)
52T955 CL17	over 0.143 - 0.145 in. (over 3.632 - 3.683 mm)
52T955 CL20	over 0.149 - 0.151 in. (over 3.785 - 3.835 mm)
52T955 CL24	over 0.157 - 0.159 in. (over 3.988 - 4.039 mm)
52T955 CL27	over 0.163 - 0.165 in. (over 4.140 - 4.191 mm)
52T955 CL30	over 0.169 - 0.171 in. (over 4.293 - 4.343 mm)
52T955 CL33	over 0.175 - 0.177 in. (over 4.445 - 4.496 mm)
52T955 CL36	over 0.181 - 0.183 in. (over 4.597 - 4.648 mm)
52T955 CL39	over 0.187 - 0.189 in. (over 4.750 - 4.801 mm)
52T955 CL42	over 0.193 - 0.195 in. (over 4.902 - 4.953 mm)
52T955 CL45	over 0.199 - 0.201 in. (over 5.055 - 5.105 mm)
52T955 CL48	over 0.205 - 0.207 in. (over 5.207 - 5.258 mm)



BM5 71 00 00 5 KSMO - 01

Main Oil Pressure Limits (Pre SB PW4 ENG 75-95) (Sheet 1/2)
Figure 534



BM5 71 00 00 5 KSTO 00

Main Oil Pressure Limits (Post SB PW4 ENG 75-95) (Sheet 2/2)
Figure 535

Tube Metering Nipple Class Selection
Table 508

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

1 If oil pressure readings are not within specified limits select new class oil tube metering nipple. (Ref. Fig. 538) and (Ref. Table 508).

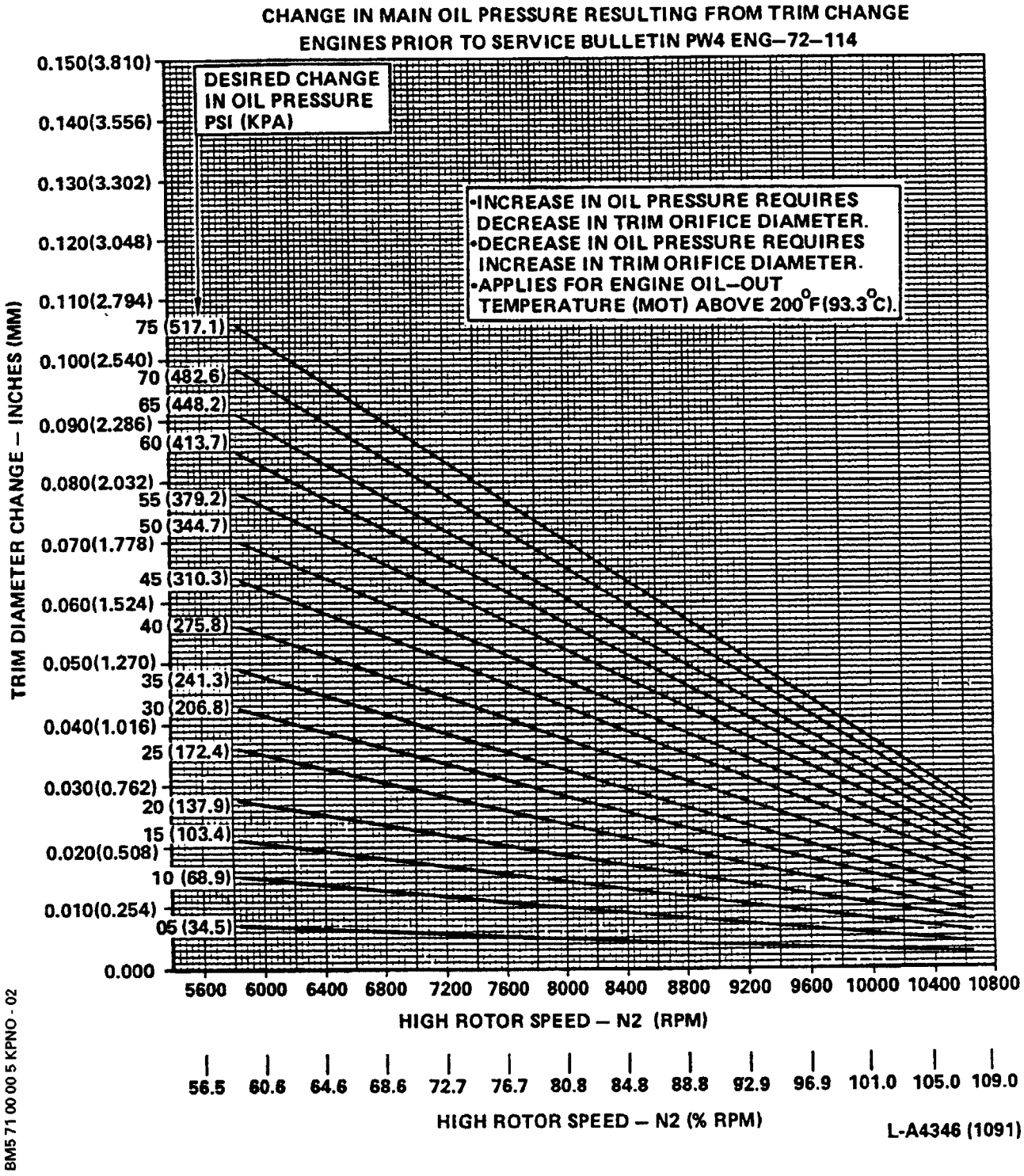
PART NUMBER	ORIFICE DIAMETER
52T955 CL1	over 0.099 - 0.101 in. (over 2.515 - 2.565 mm)
52T955 CL2	over 0.104 - 0.106 in. (over 2.642 - 2.692 mm)
52T955 CL3	over 0.109 - 0.111 in. (over 2.769 - 2.819 mm)
52T955 CL4	over 0.114 - 0.116 in. (over 2.895 - 2.946 mm)
52T955 CL5	over 0.119 - 0.121 in. (over 3.023 - 3.073 mm)
52T955 CL7	over 0.123 - 0.125 in. (over 3.124 - 3.175 mm)
52T955 CL8	over 0.125 - 0.127 in. (over 3.175 - 3.226 mm)
52T955 CL9	over 0.127 - 0.129 in. (over 3.226 - 3.277 mm)
52T955 CL10	over 0.129 - 0.131 in. (over 3.276 - 3.327 mm)
52T955 CL11	over 0.131 - 0.133 in. (over 3.327 - 3.378 mm)
52T955 CL13	over 0.135 - 0.137 in. (over 3.429 - 3.480 mm)
52T955 CL17	over 0.143 - 0.145 in. (over 3.632 - 3.683 mm)
52T955 CL20	over 0.149 - 0.151 in. (over 3.785 - 3.835 mm)
52T955 CL24	over 0.157 - 0.159 in. (over 3.988 - 4.039 mm)
52T955 CL27	over 0.163 - 0.165 in. (over 4.140 - 4.191 mm)
52T955 CL30	over 0.169 - 0.171 in. (over 4.293 - 4.343 mm)
52T955 CL33	over 0.175 - 0.177 in. (over 4.445 - 4.496 mm)
52T955 CL36	over 0.181 - 0.183 in. (over 4.597 - 4.648 mm)
52T955 CL39	over 0.187 - 0.189 in. (over 4.750 - 4.801 mm)
52T955 CL42	over 0.193 - 0.195 in. (over 4.902 - 4.953 mm)
52T955 CL45	over 0.199 - 0.201 in. (over 5.055 - 5.105 mm)
52T955 CL48	over 0.205 - 0.207 in. (over 5.207 - 5.258 mm)

Tube Metering Nipple Class Selection
Table 508

**ON A/C 101-200,

**ON A/C 101-200,

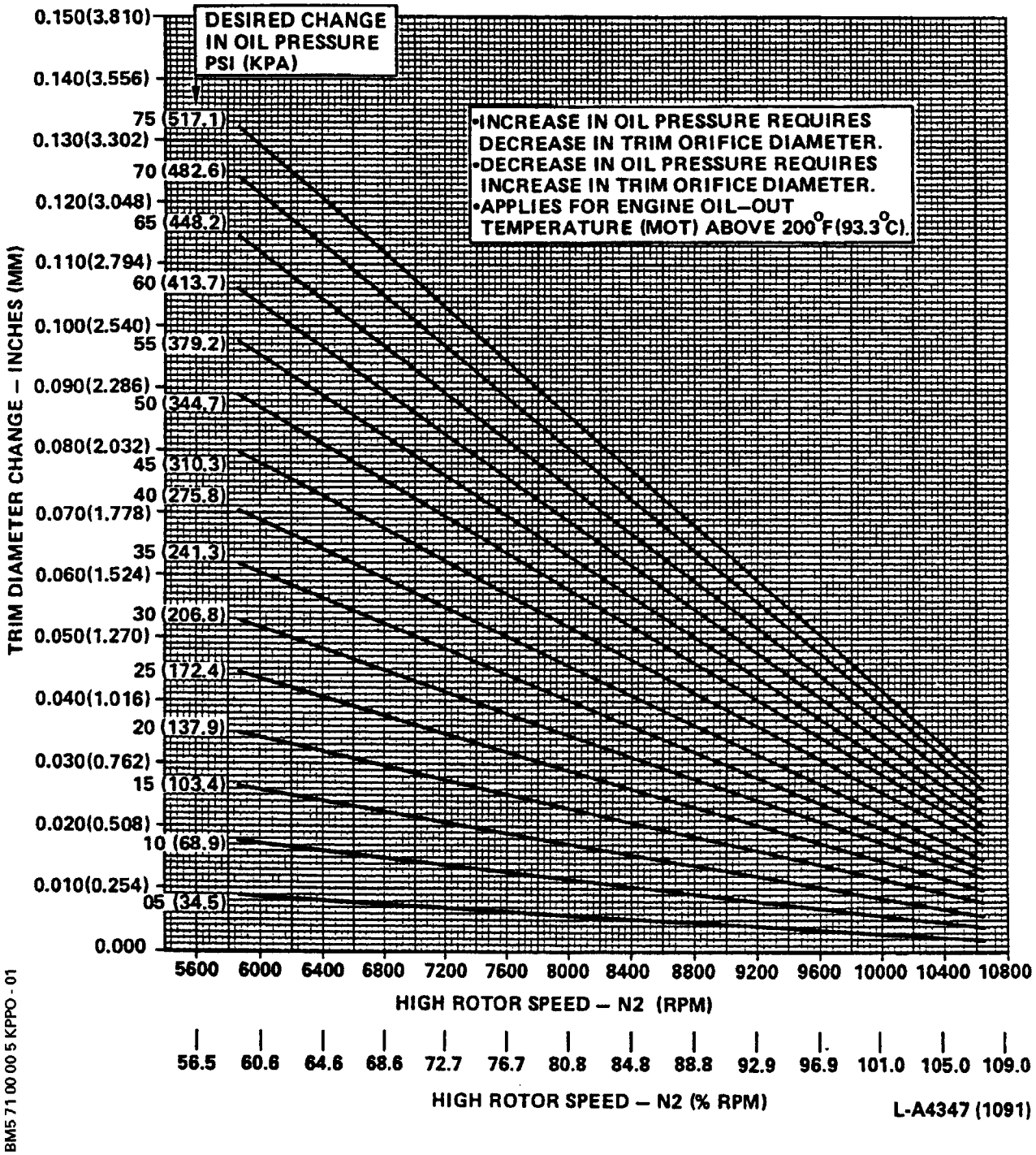
2 Open, safety and tag the appropriate circuit breakers and open the left fan and the left thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
WARNING : TAKE NECESSARY PRECAUTIONS TO AVOID POSSIBLE BURNS DUE TO



BM5 71 00 00 5 KPNO - 02

Oil Tube Metering Nipple Orifice
Diameter Selection (Pre SB PW4-ENG-72-114)
Figure 536

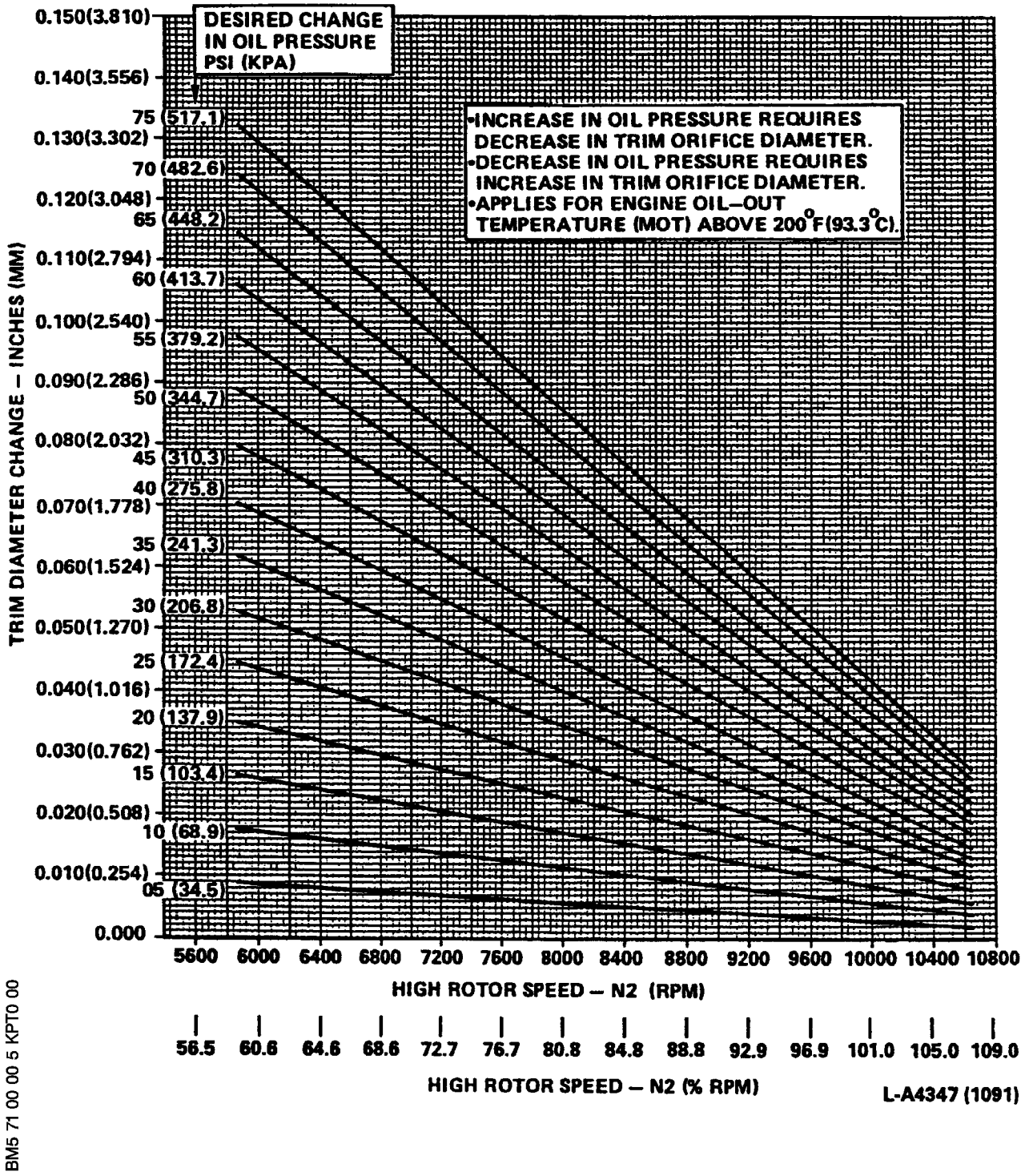
CHANGE IN MAIN OIL PRESSURE RESULTING FROM TRIM CHANGE
ENGINES INCORPORATING SERVICE BULLETIN PW 4 ENG – 72 – 114



BM5 71 00 00 5 KPPO - 01

Oil Tube Metering Nipple Orifice
Diameter Selection (Post SB PWA-ENG-72-114)
Figure 537

CHANGE IN MAIN OIL PRESSURE RESULTING FROM TRIM CHANGE



BM5 71 00 00 5 KPT0 00

Oil Tube Metering Nipple Orifice
Diameter Selection
Figure 538

R EFFECTIVITY: 101-104,

PIA

CONTACT WITH HOT OIL.

CAUTION : YOU MUST USE THE WRENCHING FLATS ON THE TUBE METERING NIPPLE WHEN YOU LOOSEN OR TIGHTEN THE TUBE NUTS. THIS WILL PREVENT ANY TWIST DAMAGE TO THE TUBES.

3 Remove the lockwire from the tube nuts. While you hold the tube metering nipple with a wrench, loosen and disconnect the tube nuts from the nipple. Remove the nipple (Ref. Fig. 539).

CAUTION : YOU MUST USE THE WRENCHING FLATS ON THE TUBE METERING NIPPLE WHEN YOU LOOSEN OR TIGHTEN THE TUBE NUTS. THIS WILL PREVENT ANY TWIST DAMAGE TO THE TUBES.

4 Lubricate the back of the ferrules on the two tube nuts that attach to the nipple with Antigalling Compound (Material No.P06-036) (Ref. Fig. 540). Install the new class nipple, threads lubricated with Antigalling Compound (Material No.P06-021), to the tube nuts and tighten by hand.

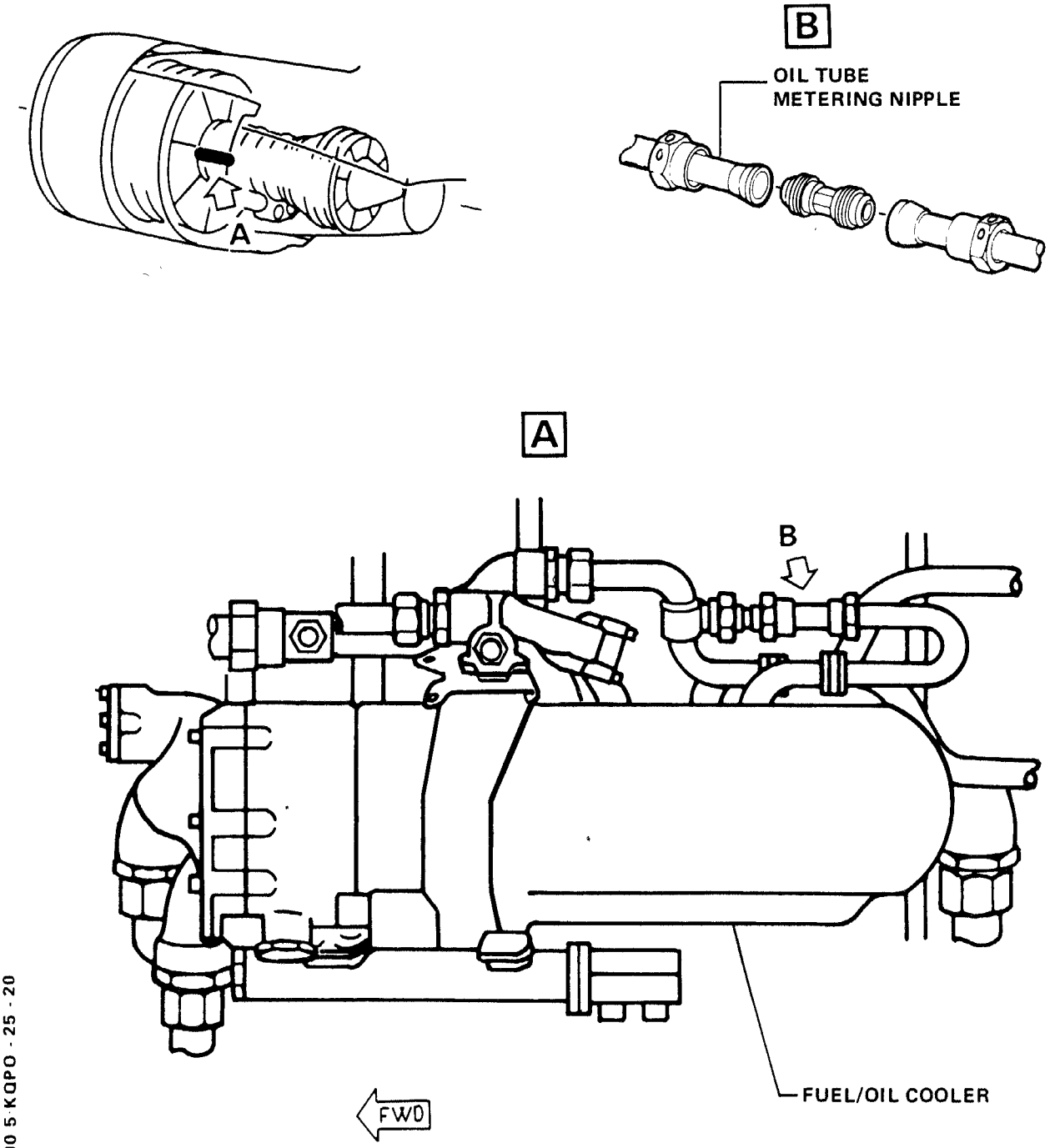
5 While you hold the nipple with a wrench, TORQUE the tube nuts to between 675 and 750 lbf.in. (7.53 and 8.47 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

6 Close left thrust reverser and left fan cowl doors (Ref. 71-13-00, P. Block 301).

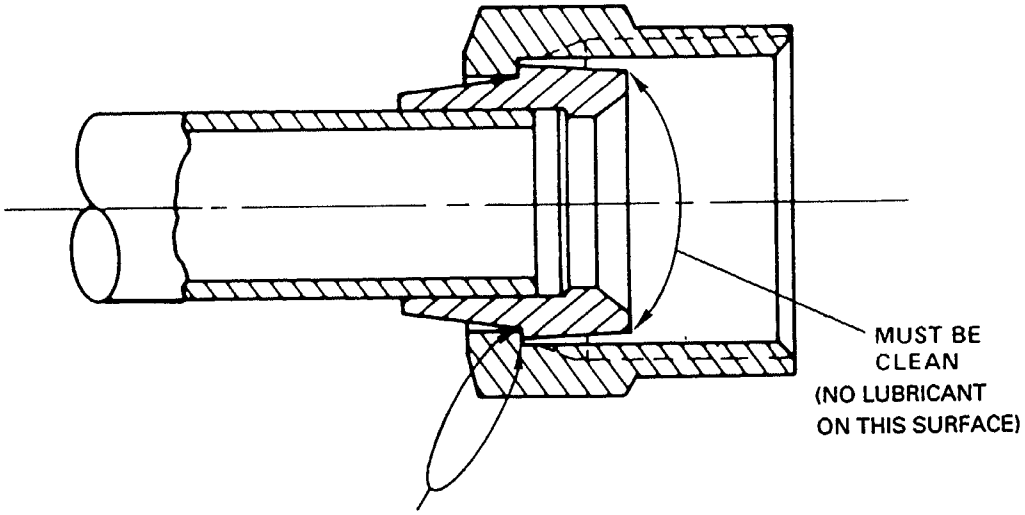
Remove safety clips and tags and close circuit breakers.

R (p)If tube metering nipple was replaced, repeat this test procedure to ensure oil pressure reading is within specified limits.

NOTE : Variation in main oil pressure reading from engine to engine is acceptable provided readings are within specified limits.



Oil Tube Metering Nipple
Location
Figure 539



BM5 71 00 00 5 KSPO - 00

Application of Lubricant to Back of Tube Ferrules
Figure 540

R X. Test No. 14 - PT2 System Leak Check

(1)General

(a)This procedure provides a test for pressurizing and leak checking the PT2 system.
The PT2 system is pressurized from the FADEC PT2/TT2 probe, located in the nose cowl to (and including) the FADEC.

(b)No leaks in the system are acceptable. Any leaks found must be corrected.

(c)This PT2 system leak check must be performed following nose cowl installation.

(2)Equipment and Materials

ITEM	DESIGNATION
(a)Material No.P05-007	Special Materials (Ref. 70-00-00)
(b)	Air Pressure Regulator With Isolation Shut Off Valve and Pressure Gage Capable of Reading 10 PSIG (0.689 BARS) With Accuracy ± 10 Percent
(c)	Tygon Flexible Tubing, 0.250 in. (6.350 mm) ID or Equivalent.

(3)Procedure (Ref. Fig. 541)

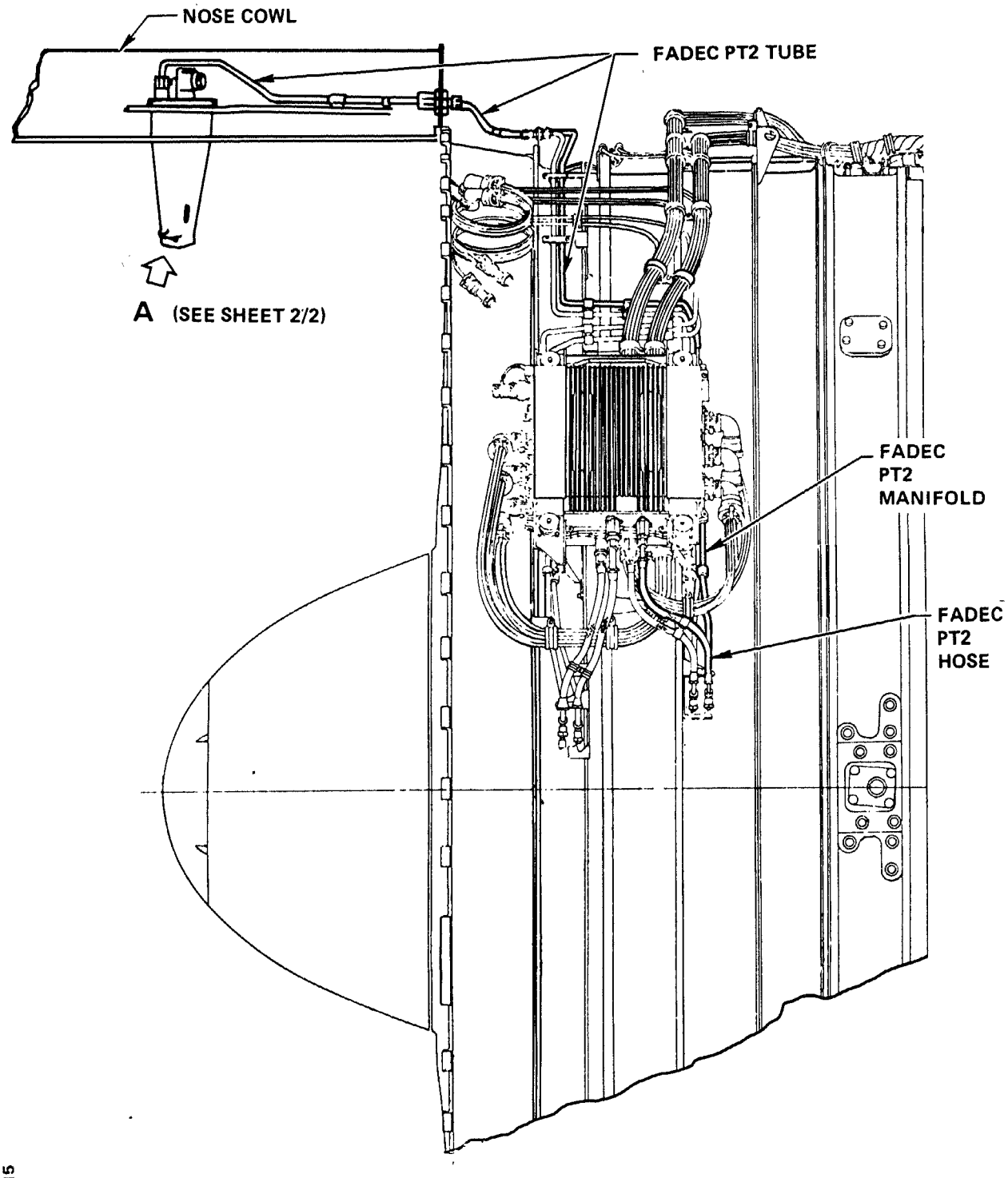
(a)Provide air pressure source with regulated output, which can be accurately set between atmospheric and 10 psig (0.689 bars). Pressure should be monitored by gage with accuracy of ± 10 percent. Air must be clean and dry.
CAUTION : DO NOT EXCEED PRESSURE OF 15 PSIG (1.034 BARS) TO PT2 SYSTEM. ENSURE AIR REGULATOR IS ADJUSTED DOWN BEFORE UPPER CASE AIR IS INTRODUCED TO PT2 SYSTEM. HIGHER PRESSURE COULD RESULT IN DAMAGE TO FADEC.

(b)Pressurize PT2 system to 10 psig (0.689 bars) maximum, at rate of 2.0 ± psig (0.138 bars) per minute while hand holding flexible tubing (Tygon tubing 0.250 in. (6.350 mm) ID or equivalent) to PT2 inlet port of probe.

(c)Shut off valve to isolate PT2 system.
If pressure drops, use Material No.P05-007 to locate leak. Repair as necessary.

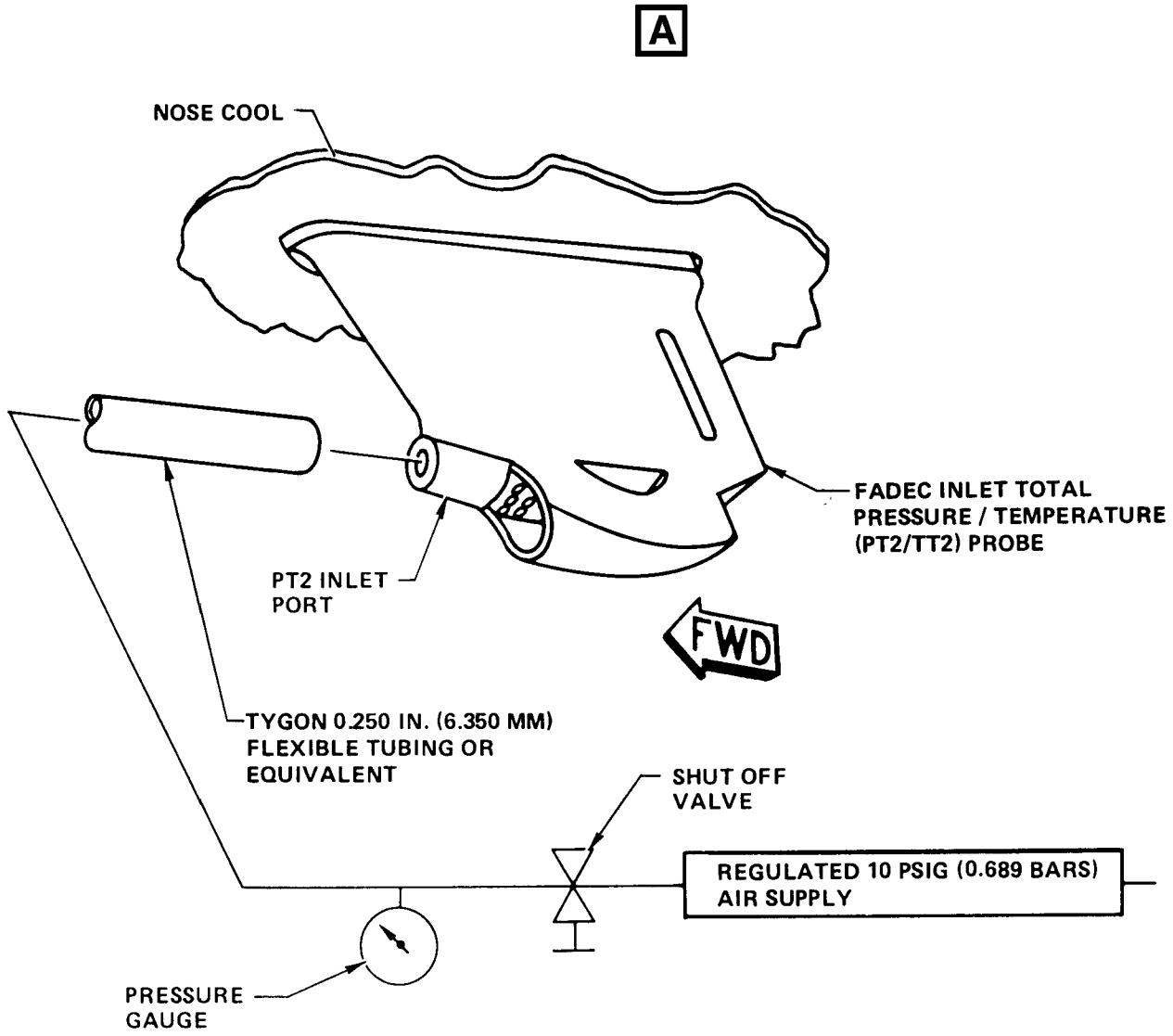
(d)Repeat test to ensure repair has corrected all leaks in system.

(e)Remove air source from engine.



BM5 71 00 00 5 KRPA-25-20
DM5

PT2 System Leak Check (Sheet 1/2)
Figure 541


A
NOSE COOL
FADEC INLET TOTAL PRESSURE / TEMPERATURE (PT2/TT2) PROBE
PT2 INLET PORT
FWD
TYGON 0.250 IN. (6.350 MM) FLEXIBLE TUBING OR EQUIVALENT
SHUT OFF VALVE
REGULATED 10 PSIG (0.689 BARS) AIR SUPPLY
PRESSURE GAUGE

BM5 71 00 00 5 KRPC 01

L–A4356

PT2 System Leak Check (Sheet 2/2)
Figure 541

R Y. Test No. 15 - FADEC Ground Test of the Engine Control System Actuators

(1)General

NOTE : This test is only available on aircraft equipped with FADEC SCN 10 E/U and subsequent.

(a)You can use this test to make certain the following engine components operate correctly.

1 The Full Authority Digital Engine Control (FADEC)
2 The Fuel Metering Unit (FMU)
3 The Stator Vane Actuator (SVA)
4 The 2.5 Bleed Valve Actuator (BVA)
5 The Turbine Case Cooling (TCC) actuator
6 The engine air/oil heat exchanger (AOC) valve

(2)Job Set-Up (Ref. Fig. 542)

(a)Prepare and service engine (Ref. 71-00-00, P. Block 201).

NOTE : The following step (b) is not required if no actuators have been replaced and/or no fuel lines have been opened.

(b)If a fuel line was open before this test wet motor the engine with starter to purge air from engine fuel lines for 30 secondes maximum to ensure proper actuator dynamic response and prevent unnecessary fault messages (Ref. Test No. 2).

(c)Energize the aircraft electrical network (Ref. 24-41-00, P. Block 301). Make certain that electronics racks ventilation is correct.

(d)Make certain that all circuit breakers are closed.

(e)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG2/IGNITION/SYS A	8JH	333/T71
133VU	ENGINES/ENG1 & 2/IGNITION/SYS B	2JH	333/T72
133VU	ENGINES/ENG1/IGNITION/SYS A	1JH	334/S72

(f)Check that ENG1(2) HP fuel shut off valve control lever is in OFF position.

(g)On panel 430VU :

CAUTION : HP FUEL SHUT OFF VALVE CONTROL LEVER MUST BE IN OFF POSITION BEFORE FUEL BOOST PUMPS ARE TURNED ON.

1 Press all FUEL/PUMPS pushbutton switches.
2 Check that OFF legends go off.

(h)On panel 429VU :

1 Check that ENG/IGNITION selector switch (3) is in OFF position.
2 On maintenance panel 472VU :
- Place FADEC ENG1/ENG2 switch in ENG1(2) position.
- Place ENG/FADEC/BITE/DISPLAY/TEST switch in test position.

NOTE : When ENG/FADEC/BITE/DISPLAY/TEST switch is in test position, left ECAM unit displays the current status and maintenance words in hexadecimal form (Ref. Fig. 543) and right ECAM unit displays current parametric information.

R (j)Place ENG/IGNITION selector switch (3) in CRANK position.

R (k)Engage the starter.

CAUTION : ENGINE DRIVEN HYDRAULIC PUMPS ARE HYDRAULIC FLUID LUBRICATED.

DO NOT MOTOR ENGINE UNLESS HYDRAULIC TANK PRESSURE VALUE IS WITHIN NORMAL OPERATING RANGE.

CAUTION : DURING COLD WEATHER, FULL SCALE OIL PRESSURE SURGES MAY OCCUR.

CAUTION : STARTER OPERATING LIMITS MUST BE OBSERVED (REF. 80-11-00, P. BLOCK 1).

1 On panel 429VU, press ENG1(2)/START pushbutton switch (2).

2 If APU is used, APU rating increases to 101.4 % (40712 RPM) :
- white ARM legend goes off.
- start valve opens.
- blue OPEN legend comes on.
- starter is engaged.

NOTE : If start valve fails to open automatically, it can be opened manually, respecting safety area access.

NOTE : Monitor oil pressure for positive indication and N1 and N2 for rotation. Do not extend motoring unless positive oil pressure is indicated. Observe static limitations.

R (l)When N2 reaches 10 % :
- move throttle control lever to a position between 3° and 26° TLA.

NOTE : When engine motoring reaches 10 %, PMA supplies FADEC electrical power.

R (m)On RH ECAM display unit, check that "TRA DEG" is between 40° and 60° TRA.

(3)Test procedure

(a)Continue to dry motor the engine to an N2 speed between 20.2 and 30.3 % N2 (2000 and 3000 RPM).

NOTE : When the following conditions are met, it will be able to trigger the test :
- Aircraft "on ground"
- Mn < 0.12
- 40° < TRA < 60°
- 20.2 % < N2 < 30.3 %

At this time octal label bit 273.29 "Ground Actuator Test Inhibited" will clear (Ref. Fig. 543) (To get bit status in binary form).

(b)On panel 429VU, select Alternate Mode.

1 Press MODE SELECTOR pushbutton switch (1).

NOTE : At this time Octal Label Bit 273.28 "Ground Actuator Test In Progress" will be set (Ref. Fig. 543).

(c)Maintain the conditions required above approximately 40 seconds.

NOTE : When the test is completed (in both Channels A and B) octal label bit 273.28 "Ground Actuator Test In Progress" will clear (Ref. Fig. 543).
If test is not completed (i.e. the required conditions for running the test are no longer satisfied), octal label bit 273.27 (Ground Actuator test abort) will be set (Ref. Fig. 543).
The corrective action for an abort is to re-run the test, making sure that all of the required conditions are met and continue to be met for the duration of the test.

(d)Place ignition selector switch in OFF position.

- ENG1(2)/START pushbutton switch is released and OPEN legend goes off.
- air conditioning packs open.
- start valves close.

(4)Reviewing test results

(a)If the test is completed and no faults are detected, octal label bit 350.19 - "ground actuator test pass" will be set and stored in fadec fault memory to indicate the test was successfully completed. If any faults are detected during the test the appropriate maintenance bits will be set and stored in the fadec fault memory for the most recent ground leg (Ref. Fig. 543).

(b)As long as the ENG/FADEC/BITE/DISPLAY/TEST is in test position, the results of the test can be obtained by reviewing the FADEC maintenance words on the ECAM display unit and identifing the bits that are set (Ref. 73-38-00, P. Block 501 - GROUND TEST).

NOTE : Test result can be retrieved, reviewing the FADEC non-volatile memory with a FADEC BITE DISPLAY (Ref. 73-38-00, P. Block 501 - BITE TEST) but FADEC BITE DISPLAY is not possible for five minute following engine shutdown. This lock-out can be defeated by cycling the HP fuel valve control lever of the desired engine. This action will momentarily de-power the FADEC, causing the lock-out to be released.

(5)Close-Up

(a)Return ENG/FADEC/BITE/DISPLAY TEST switch to OFF position.

(b)Return to EPR mode.

1 Release MODE SELECTOR pushbutton switch (1).

(c)Place ignition selector switch (3) in OFF position.

- ENG1(2)/START pushbutton switch is released and OPEN legend goes off.
- air conditioning packs open.
- start valves close.

(d)On panel 430VU :

- release all FUEL/PUMPS pushbutton switches (OFF legend on). (when compressors stop rotating).

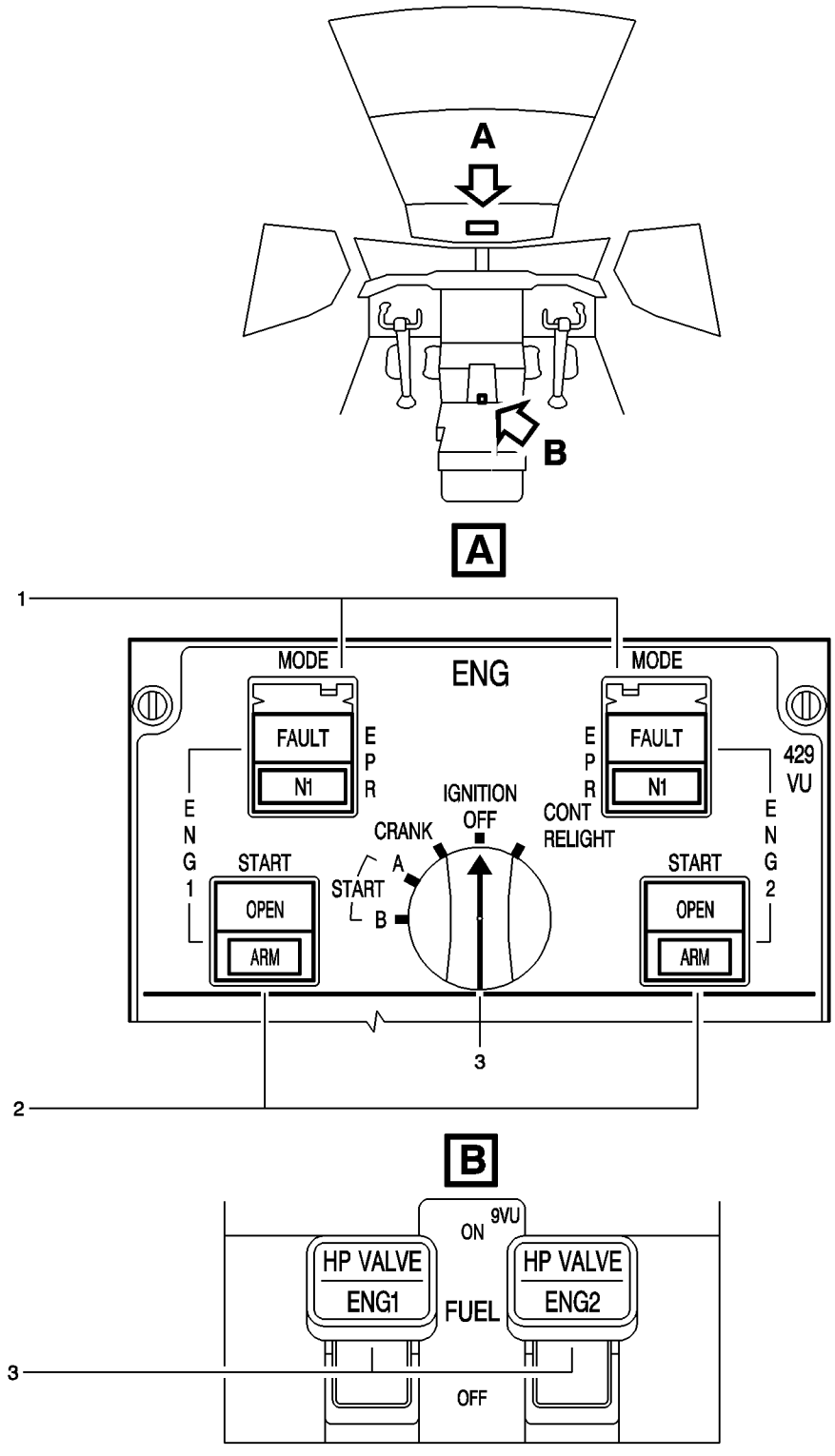
(e)Remove safety clips and tags and close circuit breakers 1JH, 2JH and 8JH.

(f)Return throttle control lever to IDLE position.

(g)De-energize the aircraft electrical network (Ref. 24-41-00, P. Block 301).

(h)Inspect the components replaced for leaks.

R (j)Perform the necessary maintenance actions for the maintenance messages generated (Ref. TSM 73-21-40).



BM5 71 00 00 5 KAC0 00

Controls - Component Location
Figure 542

LEFT HEX DIGIT	BITS				HEX DIGIT	BITS				HEX DIGIT	BITS				RIGHT HEX DIGIT	BITS			
	29	28	27	26		25	24	23	22		21	20	19	18		17	16	15	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	0	0	0	1	1	0	0	0	1	1	0	0	0	1
2	0	0	1	0	2	0	0	1	0	2	0	0	1	0	2	0	0	1	0
3	0	0	1	1	3	0	0	1	1	3	0	0	1	1	3	0	0	1	1
4	0	1	0	0	4	0	1	0	0	4	0	1	0	0	4	0	1	0	0
5	0	1	0	1	5	0	1	0	1	5	0	1	0	1	5	0	1	0	1
6	0	1	1	0	6	0	1	1	0	6	0	1	1	0	6	0	1	1	0
7	0	1	1	1	7	0	1	1	1	7	0	1	1	1	7	0	1	1	1
8	1	0	0	0	8	1	0	0	0	8	1	0	0	0	8	1	0	0	0
9	1	0	0	1	9	1	0	0	1	9	1	0	0	1	9	1	0	0	1
A	1	0	1	0	A	1	0	1	0	A	1	0	1	0	A	1	0	1	0
B	1	0	1	1	B	1	0	1	1	B	1	0	1	1	B	1	0	1	1
C	1	1	0	0	C	1	1	0	0	C	1	1	0	0	C	1	1	0	0
D	1	1	0	1	D	1	1	0	1	D	1	1	0	1	D	1	1	0	1
E	1	1	1	0	E	1	1	1	0	E	1	1	1	0	E	1	1	1	0
F	1	1	1	1	F	1	1	1	1	F	1	1	1	1	F	1	1	1	1

BM5 71 00 00 5 KDC0 00

FADEC Conversion Table (Hexidecimal to Bit)
Figure 543

1. Power Plant Nacelle Structure Inspection

A. General

(1) This procedure provides flyable damage limits for the inlet cowl, fan cowl doors, thrust reverser translating sleeves, engine exhaust nozzle, and engine exhaust plug.
(2) Damage limits for sheet metal structure, for composite structure, and for bonded or brazed metal panels are classified as "unlimited usage" for which repair is not required, and "time limited" for which repair is required.
(3) Repairs required for individual components (e.g., Inlet Cowl, Nozzle or Thrust Reverser) are contained within in the respective Component Maintenance Manual or the Structural Repair Manual.

B. Inspect Power Plant Nacelle Structure

(1) Inspect Inlet Lip for allowable damage limits per Table 601.
(2) Inspect Outer Barrel, Translating Sleeve, and Fan Cowl Door composite structure for allowable damage limits per Table 602.
(3) Inspect Titanium and Aluminum Bulkhead for allowable damage limits per Table 603.
(4) Inspect Aft Barrel for allowable damage limits to sheet metal per Table 604.
(5) Inspect Bonded Aluminum Acoustic Panel for allowable damage limits per Table 605.
(6) Inspect Nozzle Acoustical Panel and Plug for allowable damage limits per Table 606.
NOTE : If additional information is needed to perform visual inspection, refer to the Structural Repair Manual (SRM).

C. Zone Identification of Allowable Damage

(1) Inlet Lip Allowable Damage Limits. (Ref. Fig. 601) for location of damage zones and Table 601 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
CL1 - Lip segment splice fastener areas and fastener areas of lip skin to inlet cowl forward bulkhead attachment.
CL2 - Lip skin areas within 1.60 inch (40.6 mm) or 20 times skin thickness of inlet cowl forward bulkhead.
CL3 - All areas of lip skin not in Zones CL1 and CL2.
(2) Outer Barrel Allowable Damage Limits (Ref. Fig. 602) for location of damage zones and Table 602 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
C1 - Forward barrel land and aft barrel land, interfacing with the forward and aft inlet cowl bulkheads.
C2 - Horizontal lands of upper barrel half and lower barrel half in splice areas.
C3 - Circumferential frames containing honeycomb core.
C4 - Access panel frames.

C5 - Anti-ice air vent frame.
C6 - Outer barrel panel skins, bonded by frames, bulkhead lands, splice lands, and access panel frames.
Includes all areas not covered in Zones C1 through C5.

(3)Translating Sleeve Allowable Damage Limits (Ref. Fig. 604, 605) for location of damage zones and Table 603 for allowable damage type, limits, and disposition.
Damage zones are identified as follows :
T1 - Areas 5.00 inches (127.0 mm) or less from upper or lower sliders on outer barrel.
T2 - Areas 5.00 inches (127.0 mm) or less from upper or lower track fairings on pressure shelf.
T3 - Forward edge of the translating sleeve.
T4 - Forward full depth honeycomb sandwich section and aft full depth honeycomb sandwich section.
T5 - Panned down areas forward, aft, and between full depth honeycomb sandwich sections.

(4)Left and Right Hand Fan Cowl Door Allowable Damage Limits (Ref. Fig. 603) for location of damage zones and Table 602 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
D1 - Areas 5 inches (127 mm) or less from hinge or latch fittings.
D2 - Forward and aft edges of door.
D3 - Area 3 inches (76.2 mm) or less from pressure relief door or hold-open rod fittings.
D4 - The main body of the door which is a full depth sandwich panel.
D5 - Forward and aft door lands.

(5)Inlet Cowl Forward and Aft Bulkhead Allowable Damage Limits (Ref. Fig. 606) for locations of damage zones and Table 603 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
CB1 - Forward bulkhead panel webs.
CB2 - Aft bulkhead panel webs.
CB3 - Stiffeners, cap angles, and doublers.
CB4 - Forward bulkhead fastener joints.
CB5 - Aft bulkhead fastener joints.

(6)Thrust Reverser Aft Barrel Sheet Barrel Allowable Damage Limits (Ref. Fig. 607, 608) for damage zones and Table 604 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
TS1 - Panel skin.
TS2 - Frame, longeron, stiffener, and intercostal.
TS3 - Pressure shelf.
TS4 - Cap angle.
TS5 - Fastener joint.
TS6 - Fireshield.

(7)Inlet Cowl Inner Barrel Acoustic Panel Allowable Damage limits (Ref. Fig. 609) for location of damage zones and Table 605 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
CA1 - Woven wire acoustic face sheet overlay.

CA2 - Perforated inner face sheet.
CA3 - Aluminum honeycomb core.
CA4 - Non-perforated outer face sheet.
CA5 - Riveted joint.
CA6 - Bonded (non-riveted) joint.

(8) Thrust Reverser Acoustic Panel Allowable Damage Limits (Ref. Fig. 610, 611, 604) for location of damage zones and Table 605 for allowable damage type, limits, and disposition. Damage zones are identified as follows :
TA1 - Woven wire acoustic face sheet overlay.
TA2 - Perforated inner face sheet.

(9) Nozzle and Plug Allowable Damage Limits (Ref. Fig. 612) for location of damage zones and Table 606 for allowable damage type, limits, and disposition.

D. Damage Type Definitions. A brief description of each potential type of damage follows :

(1) Gouge - A gouge is a damage area of any size which results in a cross-sectional area change. It is usually caused by contact with a relatively sharp object which produces a continuous, sharp or smooth channel-like groove in the material.

(2) Abrasion - An abrasion is a damaged area which results in a cross-sectional area change due to scuffing, rubbing, scraping or other
R surface erosion. An abrasion is usually rough and irregular.

(3) Nick - A nick is a local gouge with sharp edges. Consider a series of nicks in a line to be a gouge.

(4) Scratch - A scratch is a line of damage in the material and results in a cross-sectional area change.

(5) Crack - A crack is a partial fracture or complete break in the material
R and produces a most significant cross-sectional area change. In appearance, it is usually an irregular line.

(6) Dent - A dent is a damage area which is depressed with respect to its normal contour. There is no cross-sectional area change in the
R material. Area boundaries are smooth. Its form is generally the result of contact with a smooth contoured object.

(7) Rip/Tear - A rip or tear of woven wire mesh denotes a sharp continuous separation of wire fibers.

(8) Hole - A hole constitutes a complete penetration of the material.

(9) Delamination - A separation of the bonded laminated material plies from each other.

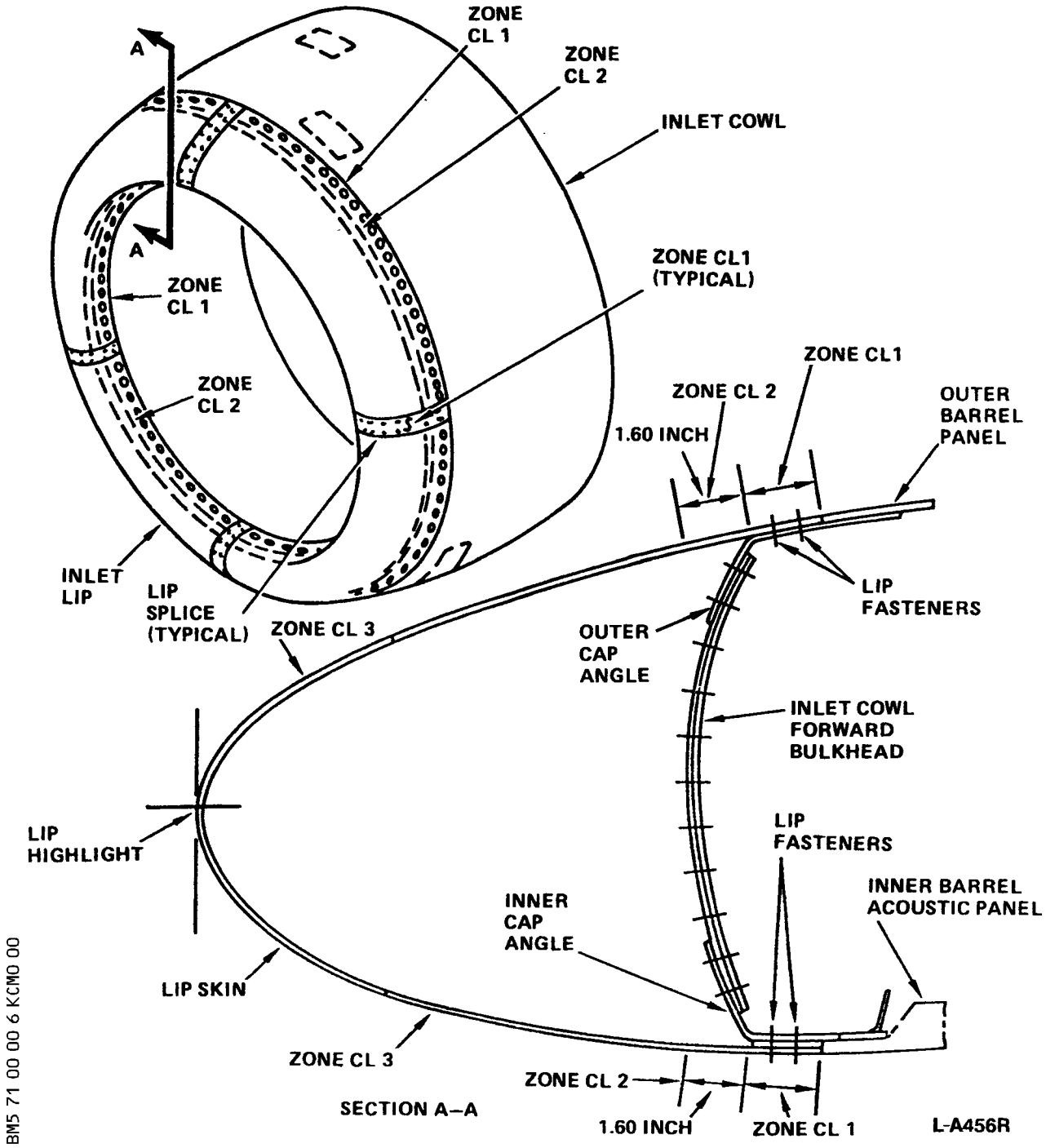
(10) Void/Disbond - A separation of the face sheet from the honeycomb core.

R Aluminum Inlet Lip-Allowable
R Damage Limits
R Table 601

Damage	Zone	Limitations	Disposition
Abrasion	CL1 CL2	Maximum depth 0.010 inch (0.254 mm). If greater, consider as a crack.	Inspect "A" check OK for flight if within limits.
	CL3	Maximum depth 0.020 inch (0.508 mm). If greater, consider as a crack.	Inspect "A" check OK for flight if within limits.
CAUTION : BE SURE NOT TO DAMAGE UNDERLYING STRUCTURE WHEN DRILLING OR CUTTING THE REPAIR AREA. USE A DRILL STOP AS NECESSARY TO PREVENT DRILLING BEYOND THE 0.080 INCH (2.032 MM) LIP SKIN.			
Crack	CL1	Maximum length 3.0 inches (76.2 mm) and less than 1.0 inch (25.4 mm) in bend area. No two cracks within 10 inches (254 mm). Terminated cracks not to exceed three adjacent fastener holes in a joint of 10 or more fasteners. 0.120 inch (3.048 mm) maximum stop drill. Do not install protective tape.	Stop drill before flight. Inspect at "A" check. Repair next "C" check.
	CL2	Maximum length 3.0 inches (76.2 mm). Crack must be separated circumferentially by 24.00 inches (609.6 mm) of undamaged skin. 0.120 inch (3.048 mm) maximum stop drill. Do not install protective tape.	Stop drill before flight. Inspect at "A" check. Repair next "C" check.
	CL3	Maximum length 3.0 inches (76.2 mm). Crack must be separated circumferentially by 24.00 inches (609.6 mm) of undamaged skin. 0.120 inch (3.048 mm) maximum stop drill. Do not install protective tape.	Stop drill before flight. Inspect at "A" check. Repair next "C" check.
Dent	CL3	Maximum depth 0.15 inch (3.81 mm). Maximum length	OK for flight if within limits.

Damage	Zone	Limitations	Disposition
		2.0 inch (50.8 mm). Maximum area 4.0 square inches (2580.64 sq.mm). No two within 12.0 inches (304.8 mm). None allowed within 1.60 inches (40.64 mm) of forward bulkhead. Ratio of diameter to depth not to be less than 10.	Inspect at "A" check.
Gouge/ Scratch	CL1 CL2	Maximum depth 0.010 inch (0.254 mm). Maximum length 6.00 inches (152.4 mm). No two within 12.0 inches (304.8 mm). If depth exceeds 0.010 inch (0.254 mm) consider as a crack.	OK for flight if within limits. Inspect "A" check.
	CL3	Maximum depth 0.020 inch (0.508 mm). Maximum length 6.00 inches (152.4 mm). No two within 12.0 inches (304.8 mm). If depth exceeds 0.020 inch (0.508 mm) consider as a crack.	OK for flight if within limits. Inspect "A" check.
Nick	CL1 CL2	Maximum depth 0.010 inch (0.254 mm). Maximum length 1.0 inch (25.4 mm). Maximum width 0.10 inch (2.54 mm). No two within 12.0 inches (304.8 mm). If depth exceeds 0.010 inch (0.254 mm) consider as a crack. If length exceeds 1.0 inch (25.4 mm) consider as a gouge.	OK for flight if within limits. Inspect "A" check.
	CL3	Maximum depth 0.020 inch (0.508 mm). Maximum 1.0 inch (25.4 mm). Maximum width 0.10 inch (2.54 mm). No two within 12.0 inches (304.8 mm). If depth exceeds 0.020 inch (0.508 mm) consider as a crack. If length exceeds 1.0 inch (25.4 mm) consider as a gouge.	OK for flight if within limits. Inspect "A" check.

Damage	Zone	Limitations	Disposition



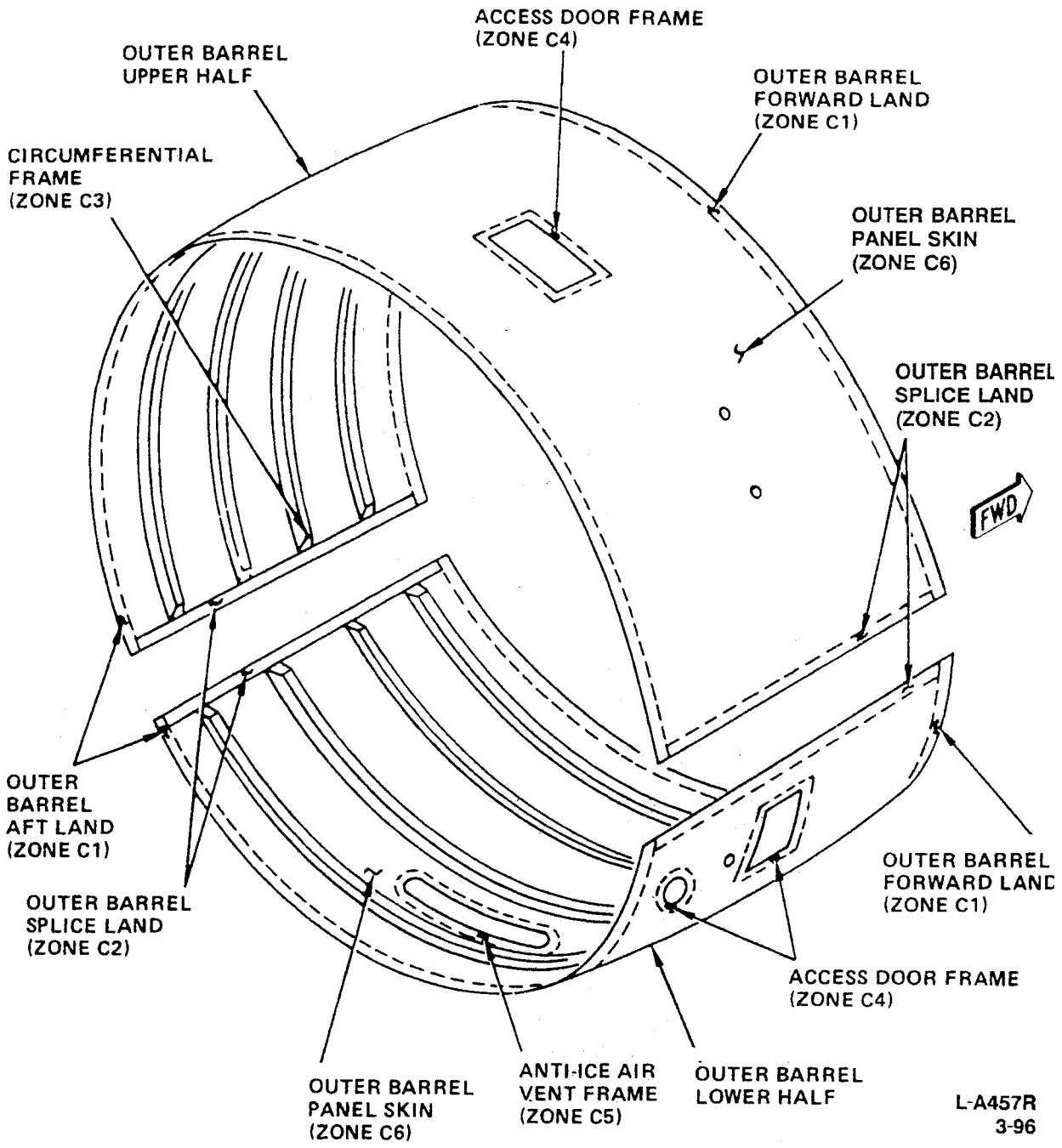
Aluminum Inlet Lip-Allowable Damage Limits
Figure 601

R Outer Barrel, Translating Sleeve, and Fan Cowl Door Composite
R Structure - Allowable Damage Limits
R Table 602

Damage	Zone	Limitations	Disposition
Abrasion	C1, C2, C3, C4, C5, C6, T1, T2, T3, T4, T5, D1, D2, D3, D4, D5	Damage to surface resin only allowable. Fibers must not be damaged. Protect damaged area from moisture by applying appropriate sealing tape.	OK for flight if within limits. Operator option to prevent growth.
Crack	C3, C6, T3, T4, T5, D2, D4, D5	Maximum length 3.0 inch (76.2 mm) in Zones C3, C6, T4, T5, and D4. 0.25 inch (6.35 mm) maximum length allowed in Zones T3, D2, and D5 in fore and aft directions. Maximum length 1.0 inch (25.4 mm) in Zones T3 and D5 in circumferential direction. No two cracks within 10.0 inches (254.0 mm). Maximum of 5 cracks per barrel half. Cracks wider than 0.010 inch are to be treated as a hole. Cracks 0.010 inch (0.254 mm) deep or less or to be treated as scratches. Unlimited use of terminated cracks between two adjacent fasteners in joint of 10 or more fasteners. Protect crack from moisture by applying appropriate sealing tape.	Stop drill before flight. Monitor growth at "A" check. Permanent repair at next 'C' check.
Delami-nation	C6, T3, T4, T5, D2, D4	Maximum length 3.0 inch (76.2 mm) allowed in Zones C6, T4, T5, and D4. 0.75 inch (19.05 mm) maximum length and 0.25 inch (6.35 mm) maximum width allowed in Zones T3 and D2. No two delaminations within 10.0 inches (254.0 mm). Maximum of 5 delaminations per barrel half.	OK for flight if within limits. Inspect at 'A' check. Repair all delaminations at next 'C' check.

Damage	Zone	Limitations	Disposition
Gouge/ Scratch	C1, C2, C3, C4, C5, C6, D1, D2, D3, D4, D5, T1, T2, T3, T4, T5	Maximum depth 0.010 inch (0.254 mm). Maximum length 10.00 inch (254.0 mm). Maximum width 0.10 inch (2.54 mm). No two within 10.00 inches (254.0 mm). Maximum of ten gouges and ten scratches per barrel half. Protect damaged area from moisture by applying appropriate sealing tape. Replace tape if peeled or damaged.	OK for flight if within limits. Inspect 'A' check.
Hole	C3, C6, T4, T5, D4, D5	Maximum diameter 1.00 inch (25.4 mm) hole allowed in Zones C3, T4, and D5. Maximum diameter 3.00 inches (76.2 mm) hole allowed in Zones C6, T5, and D4. No two holes within 10.00 inches (254.0 mm) Maximum of five holes per barrel half. Crack wider than 0.10 inch (2.54 mm) are to be treated as hole. Protect damaged area from moisture by applying appropriate sealing tape.	Repair holes in fire barrier prior to flight. Seal all other holes with aerodynamic tape before flight. Inspect 'A' check.
Nick	C1, C2, C3, C4, C5, C6, T1, T2, T3, T4, T5, D1, D2, D3, D4, D5	Maximum depth 0.010 inch (0.254 mm). Maximum length 10.0 inches (254.0 mm). Maximum width 0.10 inch (2.54 mm). Maximum of 14 nicks per square foot of panel. Protect damage from moisture by applying appropriate sealing tape.	OK for flight if within limits. Inspect "A" check.
Erosion	D2	Erosion must not exceed 1.00 in. (25.4 mm) aft of leading edge and must not exceed an allowable maximum depth of 0.030 in. (0.76 mm). The 0.078 in. (1.98 mm) thickness at the leading edge shall consist of a least 3 plies of fabric and 3 plies	Inspect at each Airplane 'A' check.

Damage	Zone	Limitations	Disposition
		of Kevlar.	



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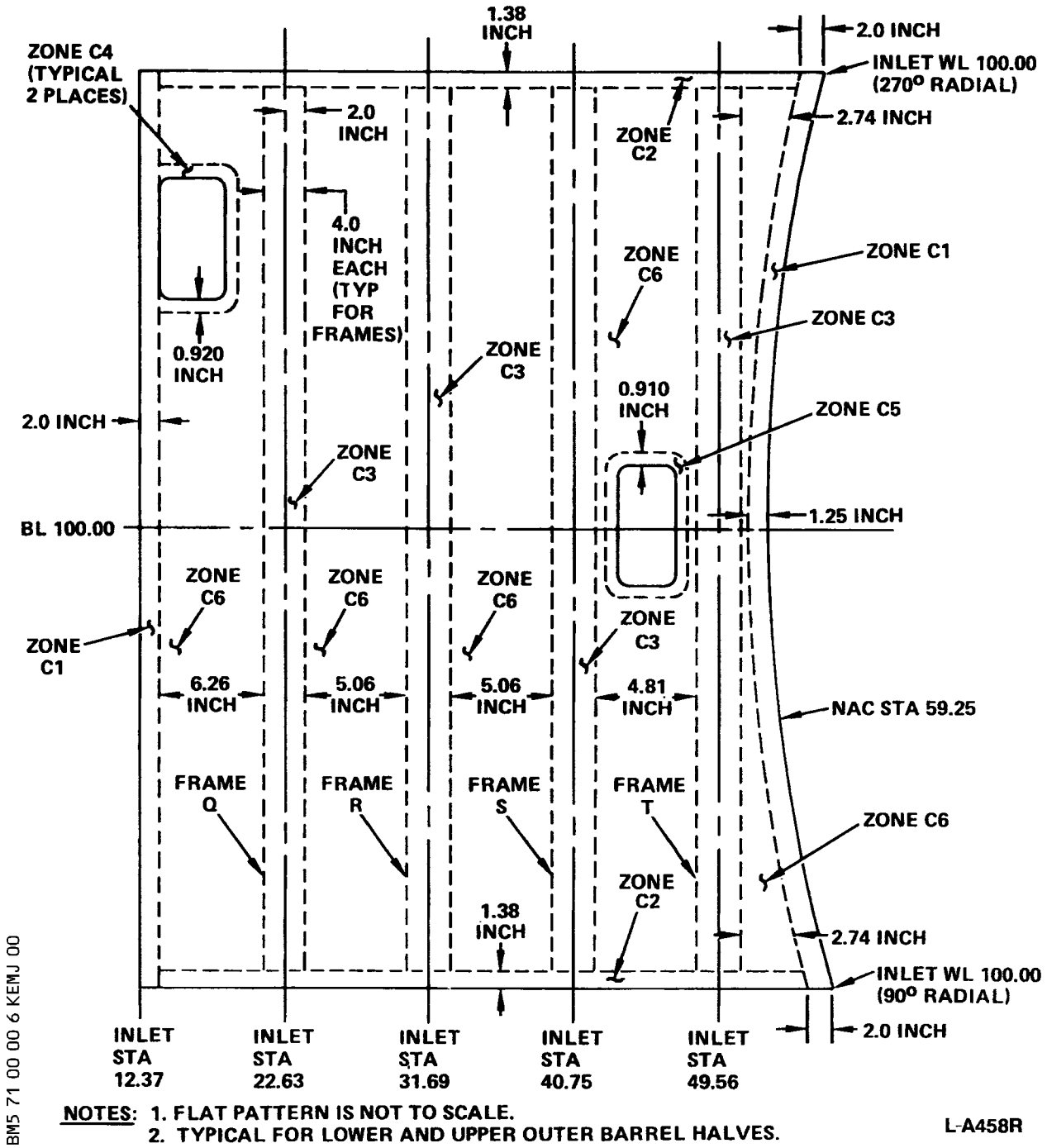
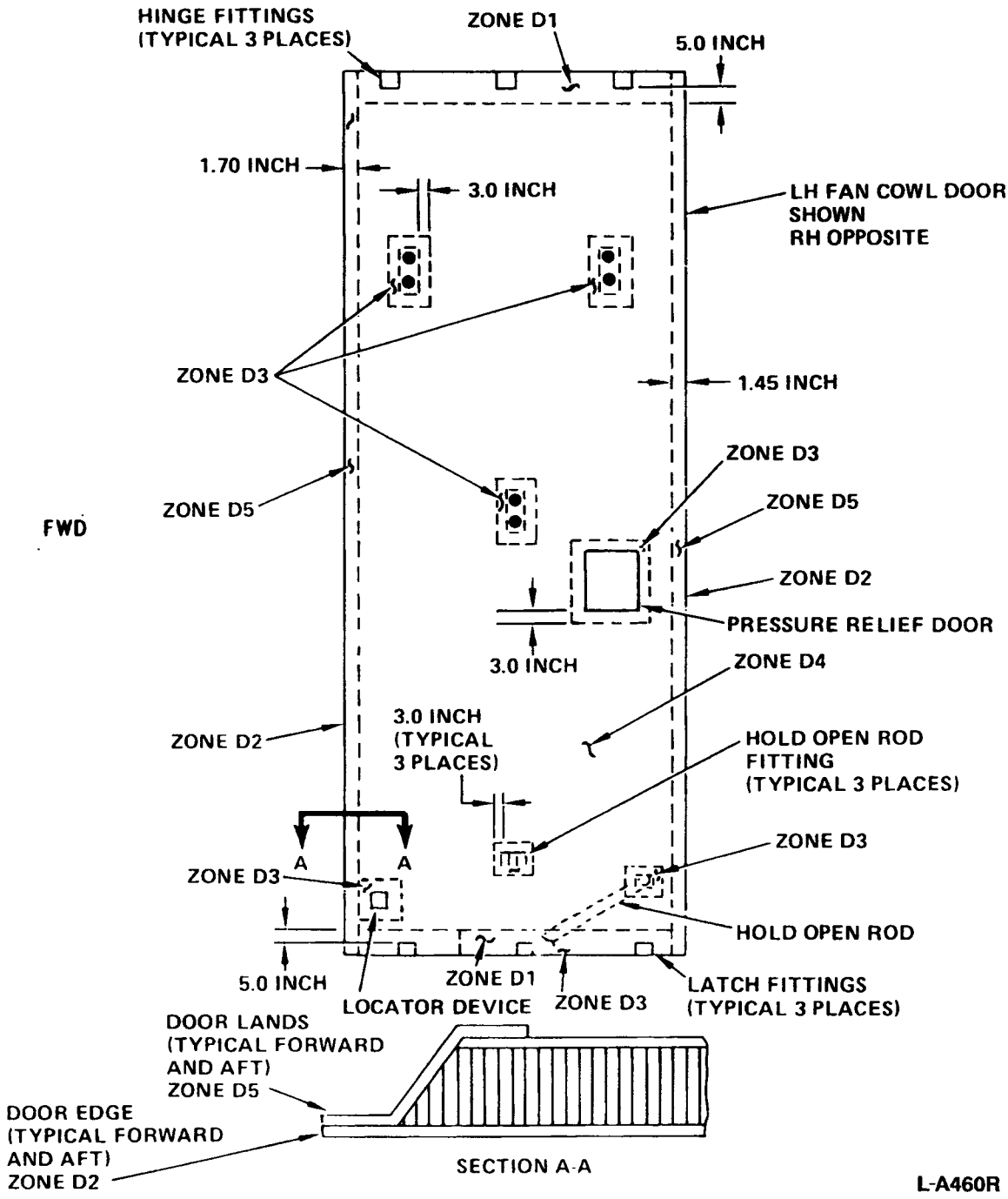
Inlet Cowl Outer Barrel Damage Zones (Sheet 1/2)
Figure 602



NOTES: 1. FLAT PATTERN IS NOT TO SCALE.
2. TYPICAL FOR LOWER AND UPPER OUTER BARREL HALVES.

Inlet Cowl Outer Barrel Damage Zones (Sheet 2/2)
Figure 602



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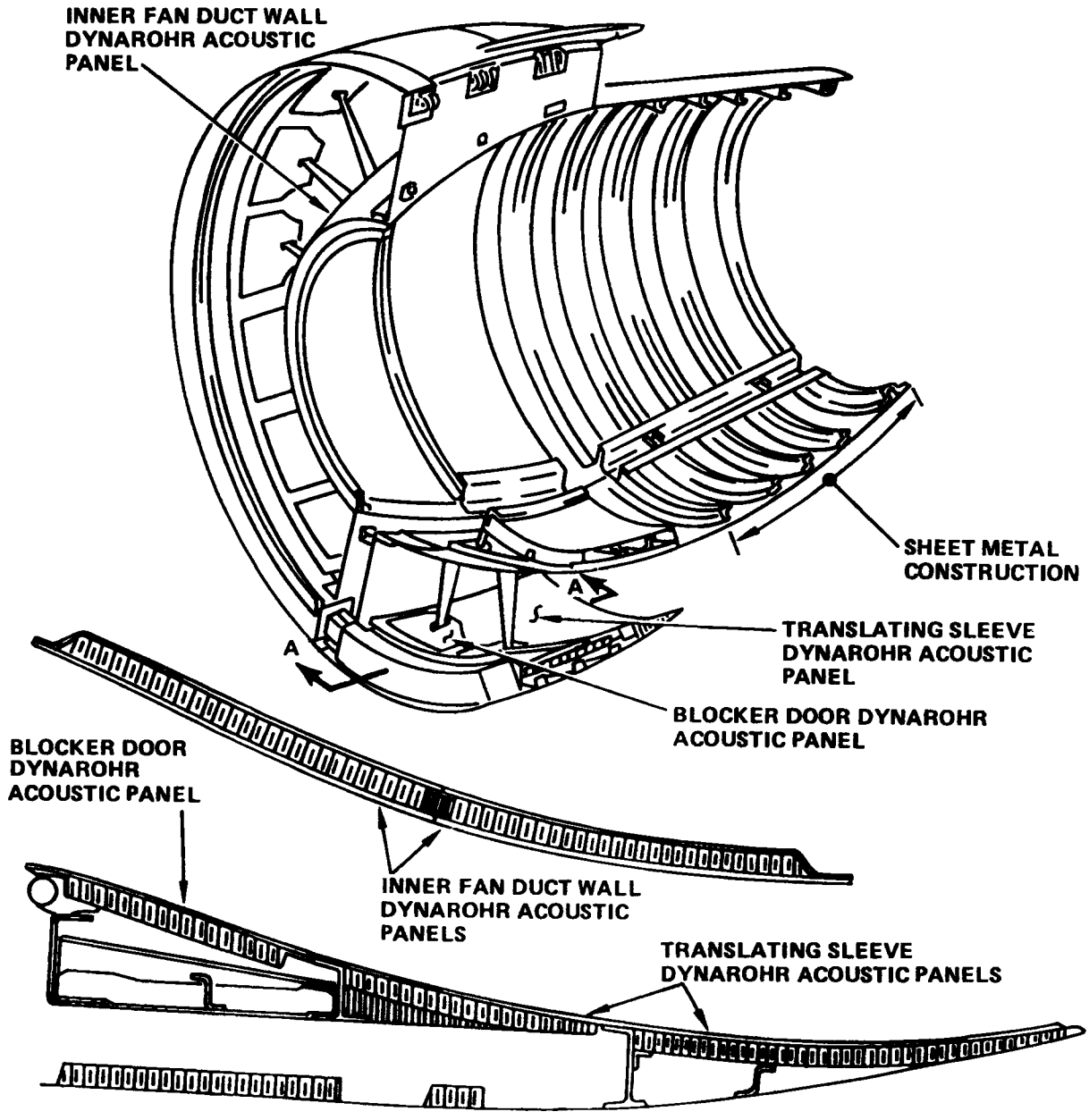
Fan Cowl Door Damage Zones
Figure 603

R Titanium and Aluminum Bulkhead - Allowable Damage Limits
R Table 603

Damage	Zone	Limitations	Disposition
Crack	CB1, CB2	Maximum length 1.00 inch (25.4 mm) to stop drill. Cracks 1.0 - 3.0 inch (25.4 - 76.2 mm) limited use to be repaired at next 'A' check. Separated from other cracks by 10.0 inch (254.0 mm).	Stop drill before flight. Monitor 'A' check.
	CB3	Maximum length 25 percent of flange width. Maximum bend area 0.99 inch (25.2 mm). No cracks within 5.00 inches (127.0 mm) of stiffener end.	Stop drill before flight. Monitor 'A' check. Permanent repair at next 'C' check.
	CB4, CB5	Separated from other cracks in joint by 10.0 inches (254.0 mm). Unlimited use of terminated crack between two adjacent fasteners in joint containing at least ten fasteners. 'A' check repair required for any crack terminating between three adjacent fasteners.	Stop drill before flight. Monitor 'A' check for growth.
Dent	CB1, CB2	Maximum width 5.00 inches (127.0 mm). Maximum depth 10 percent of width. Located minimum of 20 times sheet thickness from panel support member.	OK for flight if within limits. Inspect 'A' check.
	CB3	Maximum width 100 percent of flange width.	OK for flight if within limits. Inspect 'A' check. Repair at next 'C' check.
Gouge	CB1, CB2, CB3, CB4 CB5	Maximum depth 25 percent of material thickness, if greater treat as a crack.	OK for flight if within limits. Inspect 'A' check.
Nick	CB1, CB2, CB3, CB4 CB5	Maximum depth 25 percent of material thickness, if greater treat as a crack.	OK for flight if within limits. Inspect 'C' check.

Damage	Zone	Limitations	Disposition
Scratch	CB1, CB2, CB3, CB4 CB5	Maximum depth 25 percent of material thickness, if greater treat as a crack.	OK for flight if within limits. Inspect 'C' check.



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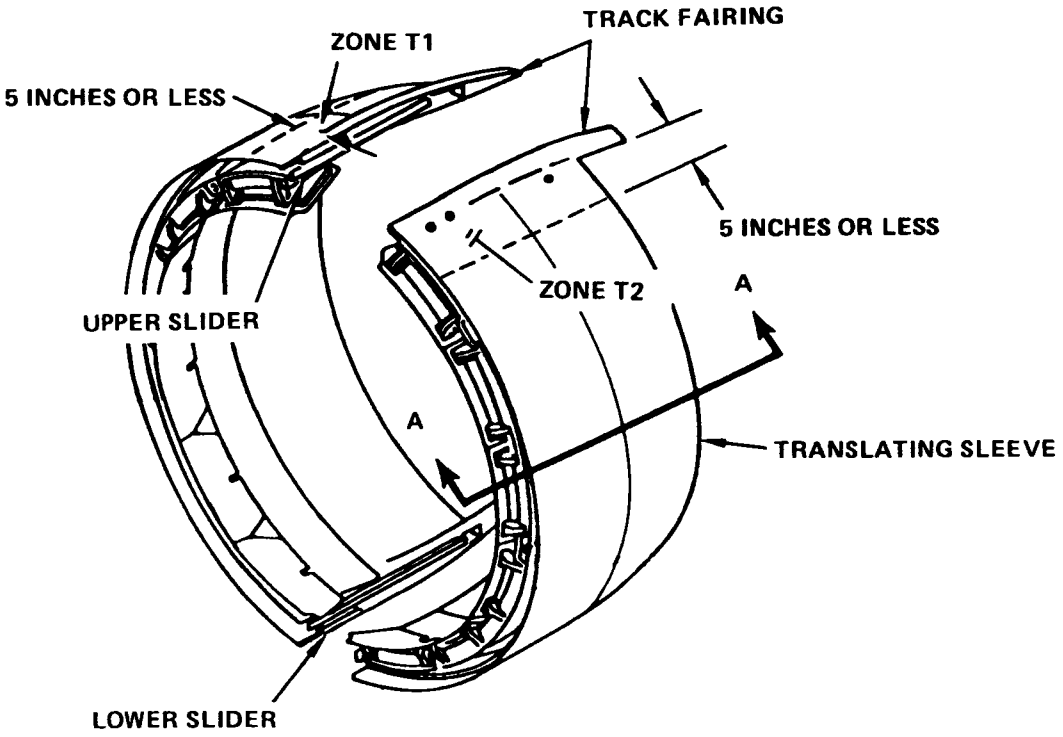
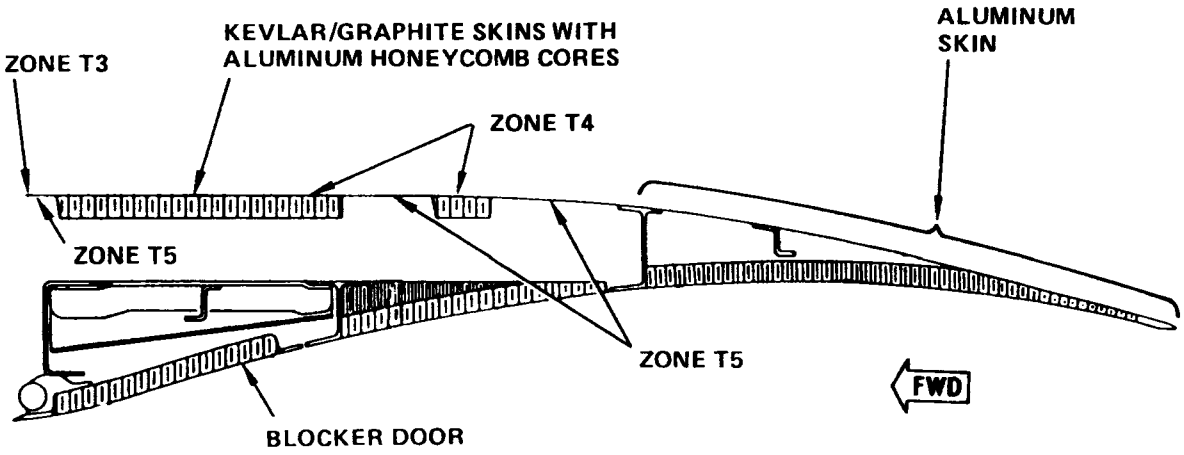
Thrust Reverser Dyna Rohr Bonded Acoustic Panels
Figure 604





SECTION A–A

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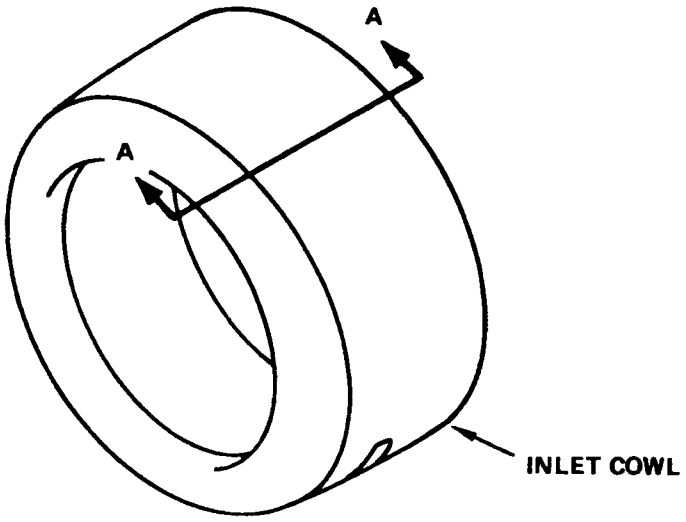
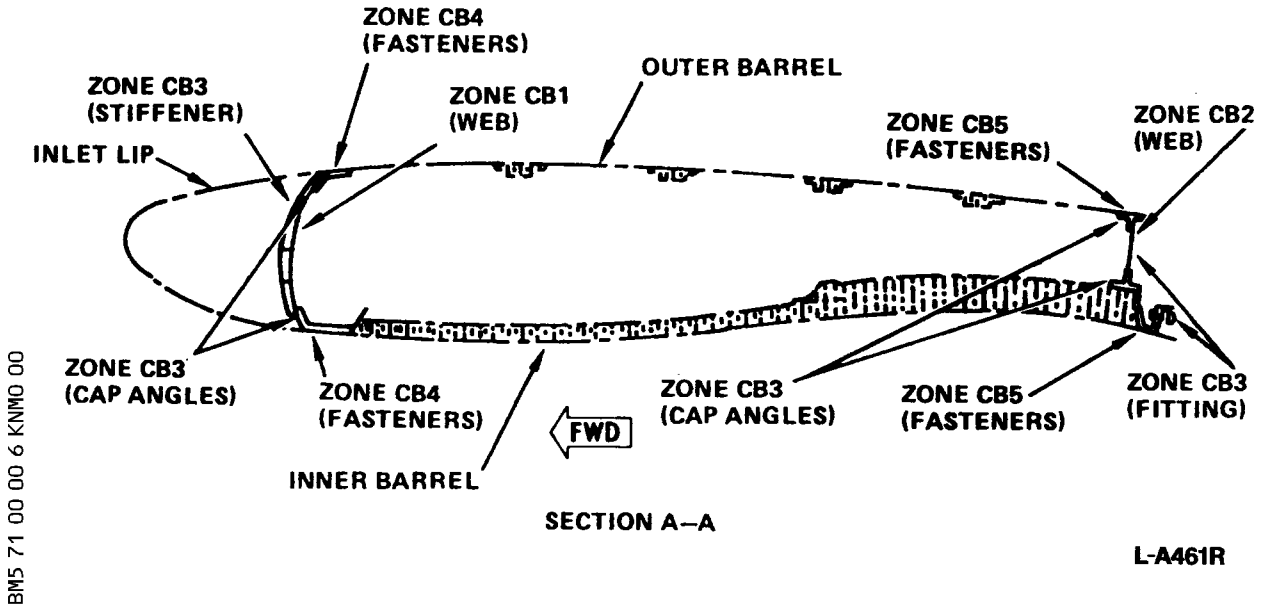
Translating Sleeve Composite Structure Damage Zones
Figure 605





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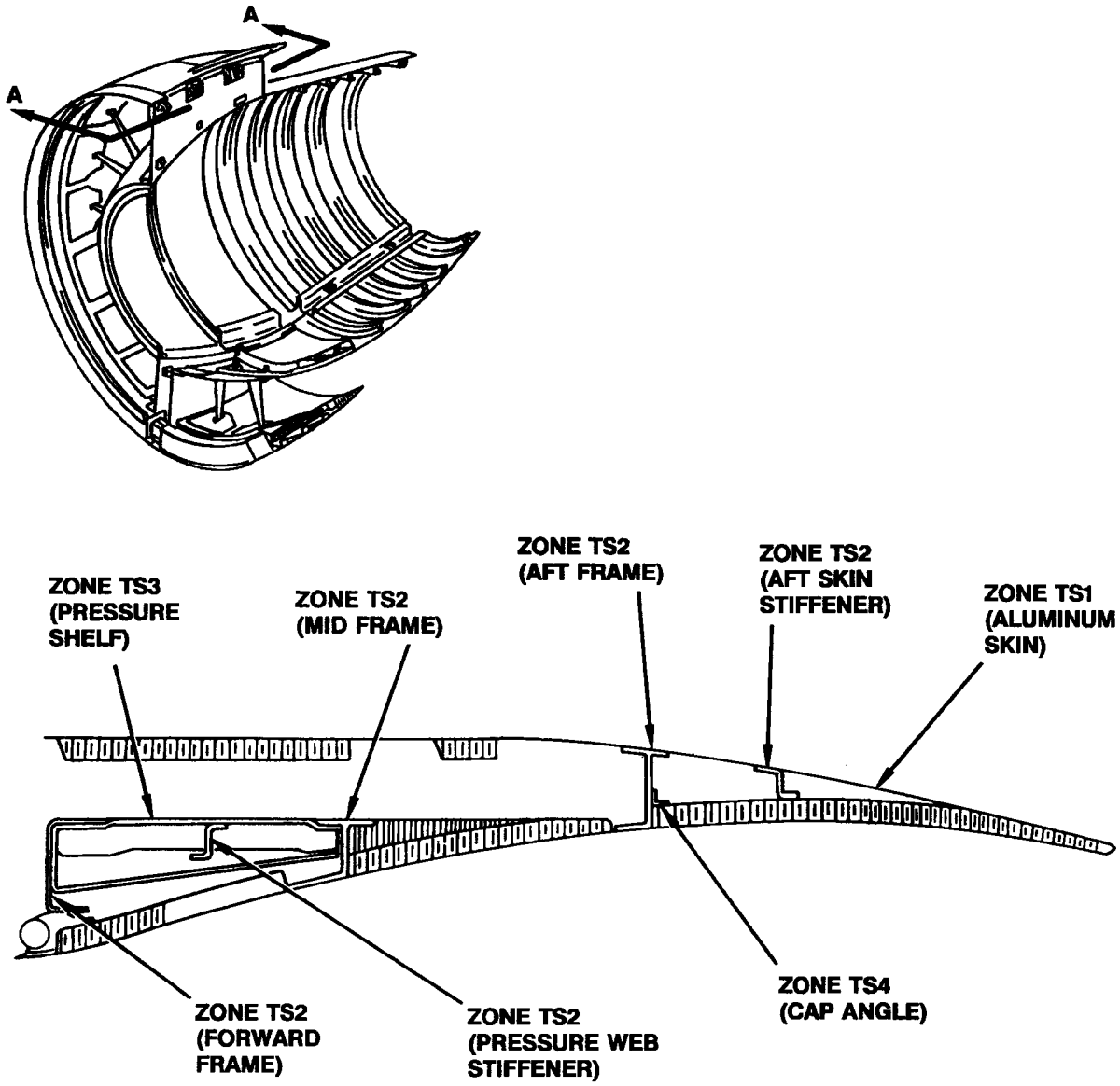
Inlet Cowl Forward and Aft Bulkhead Damage Zones
Figure 606

R Aft Barrel - Sheet Metal
R Allowable Damage Limits
R Table 604

Damage	Zone	Limitations	Disposition
Crack	TS1, TS3	Maximum length 1.00 inch (25.4 mm) to stop drill. No two within 10.0 inches (254.0 mm).	Stop drill crack. Repair next 'A' check.
	TS2	Maximum length in flange 25 percent of flange width. Maximum length in bend area 0.99 inch (25.2 mm). No two cracks within 10.00 inches (254.0 mm). No cracks within 5.00 inches (127.0 mm) of stiffener end. No cracks in sleeve forward of inner frame within 3.00 inches (76.2 mm) of track joint. No cracks in sleeve forward of outer frame within 3.00 inches (76.2 mm) of outer slider joint. No cracks within 3.00 inches (76.2 mm) blocker door hinge fitting.	Stop drill crack. Inspect 'A' check. Repair at next 'C' check.
	TS5	Maximum length 1.00 inch (25.4 mm). No two within 10.0 inches (254.0 mm). Unlimited use of terminated crack between two adjacent fasteners in joint containing ten or more fasteners. 'C' check repair required for cracks greater than 1.00 inch (25.4 mm), but less than 3.00 inch (76.2 mm). Terminated cracks not to exceed three adjacent fastener holes in a joint of ten or more fasteners.	Stop drill crack. Inspect 'A' check.
Dent	TS1, TS3, TS6	Maximum width 5.00 inches (127.0 mm). No two within 12.00 inches (304.8 mm). Must be located a minimum of 20 times sheet thickness from panel support member. Maximum depth not to exceed	OK for flight if within limits. Inspect 'A' check.

Damage	Zone	Limitations	Disposition
		ten percent of diameter.	
	TS2	Maximum width 100 percent of stiffener flange width.	Inspect 'A' check. Repair at next 'C' check.
Gouge Nick Scratch	TS1, TS2, TS3, TS4, TS5, TS6	Maximum depth 25 percent of sheet thickness. No two within 12.00 inches (304.8 mm). If depth exceeds 25 percent of material thickness, treat as crack ; except at fireshield which must be repaired or replaced.	OK for flight if within limits. Inspect 'A' check.
Hole	TS1, TS2	Maximum width 1.00 inch (25.4 mm) within 20 times sheet thickness of panel support members. Maximum 3.00 inches (76.2 mm) hole allowed in all other areas. No holes allowed 45 degrees to either side of top dead center. Seal with appropriate tape.	Inspect 'A' check. Repair at next 'C' check.



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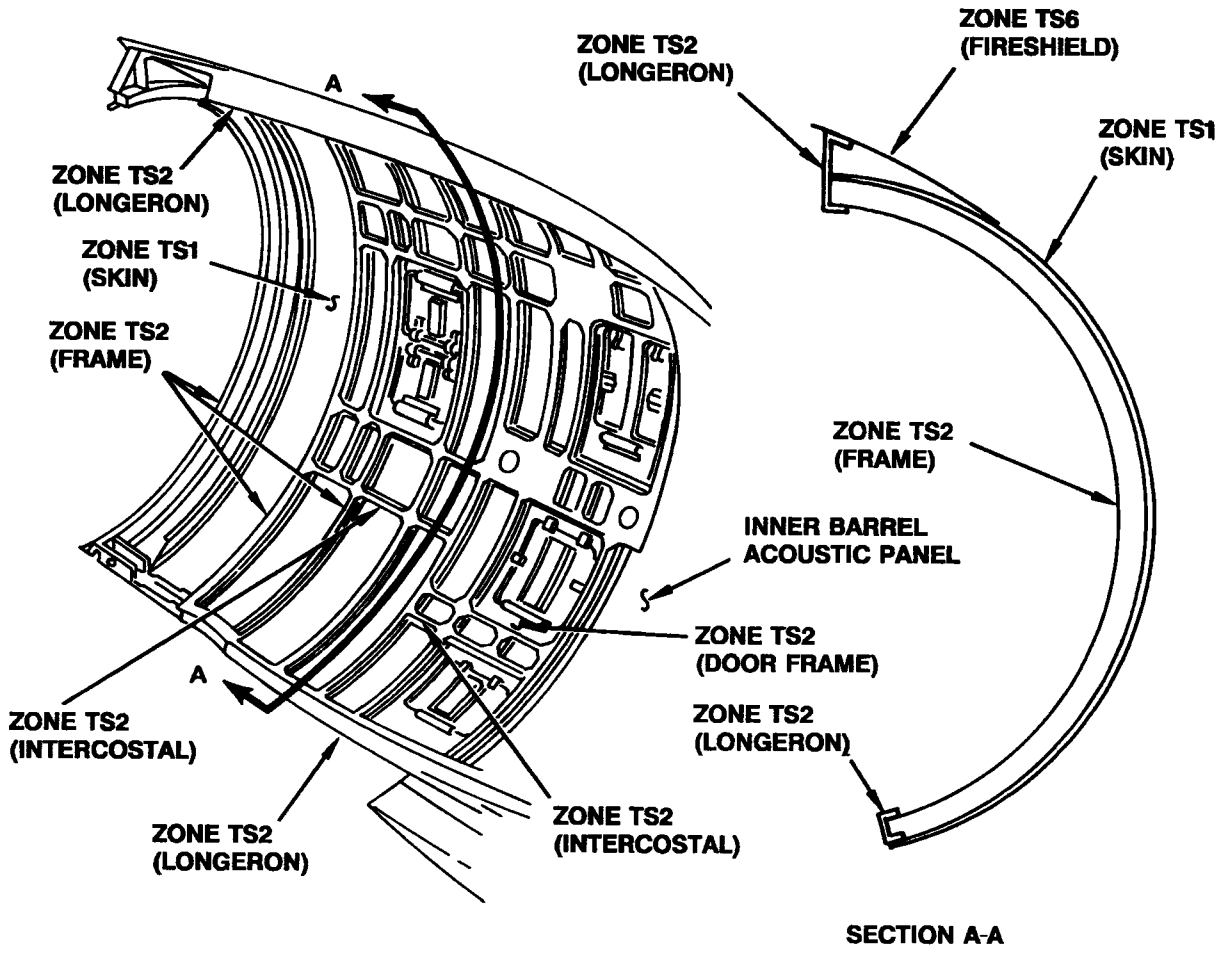
Thrust Reverser Sheet Metal Damage Zones
Figure 607



THRUST REVERSER DOOR

L-A462R

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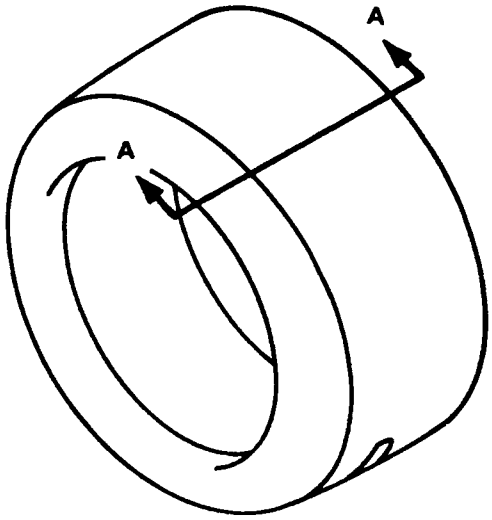
Thrust Reverser Aft Sheet Metal Damage Zones
Figure 608

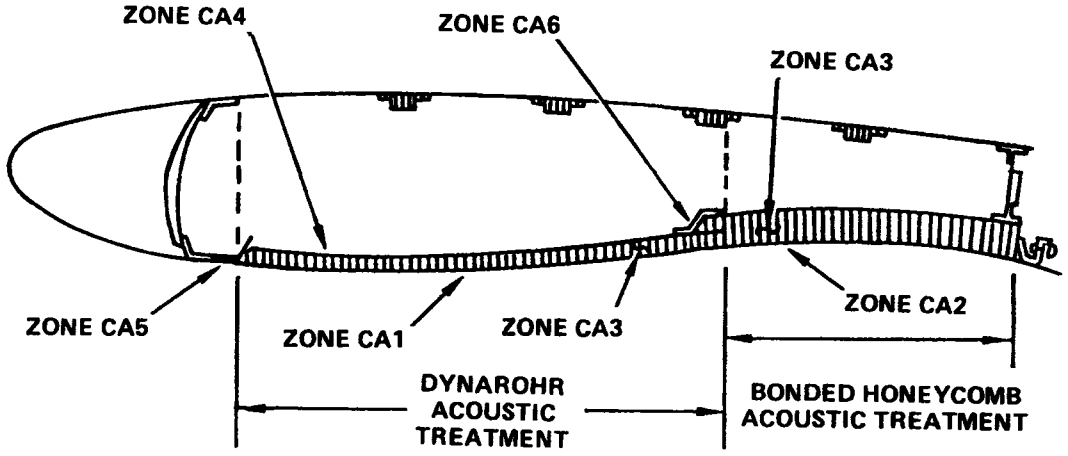
R Bonded Aluminum - Acoustic Panel
R Allowable Damage Limits
R Table 605

Damage	Zone	Limitations	Disposition
Disbond	TA2, TA4 CA2, CA4	Maximum width 1.50 inches (38.1 mm). Separated from other disbond by fully bonded panel four times diameter of disbond. Similar damage on opposite face sheet not opposed or overlapped. Maximum of two disbonds in one square foot area of panel. Minimum of 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
	TA5, CA5	Maximum area 25 percent of total area within two adjacent fasteners. 0.12 inch (3.05 mm) minimum sound joint at one edge. Disbond may not extend from one edge of faying surface to opposite edge.	OK for flight if within limits. Inspect 'A' check.
	TA6, CA6	Maximum area 15 percent of joint area for any one disbond along edge closure. 0.12 inch (3.05 mm) minimum sound joint at one edge. Disbond may not extend from one edge of faying surface to opposite edge.	OK for flight if within limits. Inspect 'A' check.
Dent	CA2, CA3, CA4	Maximum depth 0.12 inch (3.05 mm). Maximum length 2.00 inches (50.8 mm). Maximum width 1.00 inch (25.4 mm). Minimum radius 0.25 inch (6.35 mm). No face sheet thinning. Core crush acceptable. No two dents within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits.
Dent	TA2, TA3, TA4	Maximum depth 0.12 inch (3.05 mm). Maximum length	OK for flight if within limits.

Damage	Zone	Limitations	Disposition
		2.00 inches (50.8 mm). Maximum width 1.00 inch (25.4 mm). Minimum radius 1.00 inch (25.4 mm). No face sheet thinning. Core crush acceptable. No two dents within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	Inspect 'A' check.
Gouge	TA2, TA3, CA2, CA4	Maximum length 1.50 inches (38.1 mm). Maximum depth 0.10 inch (2.54 mm). Surface penetration only of perforated face sheet, with radius width. No core crush allowed. No two within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Nick	TA2, TA4, CA2, CA4	Maximum length 0.50 inch (12.7 mm). Maximum depth 0.010 inch (0.254 mm). Maximum width 0.10 inch (2.54 mm). No two nicks within 2.00 inches (50.8 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Rip	TA1, CA1	Maximum length 0.25 inch (6.35 mm). No disbond from face sheet. No two rips within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check. NOTE : wire mesh is non-structural.
Scratch	TA1, CA1	Maximum length 1.50 inches (38.1 mm). Maximum depth 0.005 inch (0.127 mm). No disbond from face sheet. No two within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Tear	TA1, CA1	Maximum length 0.25 inch (6.35 mm). No disbond	OK for flight if within limits.

Damage	Zone	Limitations	Disposition
		from face sheet. No two tears within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	Inspect 'A' check.
Void	TA2, TA4, CA2, CA4	Maximum width 1.50 inches (38.1 mm). Separated from other voids by fully bonded panel four times diameter of void. Voids on opposite face sheets not opposed or overlapped. Maximum two voids in one square foot of panel. Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Delami-nation woven wire mesh	CA1, TA1	Wire mesh cumulative loss limit is 892.8 in sq (5759.9 cm sq) for translating sleeve, blocker doors, forward and aft fan ducts. See PW4000 Structural Repair Manual 54-05-01 for wire mesh repair parameters.	Trim wire mesh and seal edges with P08-016. OK for flight after cure of sealant. Monitor for condition at 'A' check. NOTE : wire mesh is non-structural.





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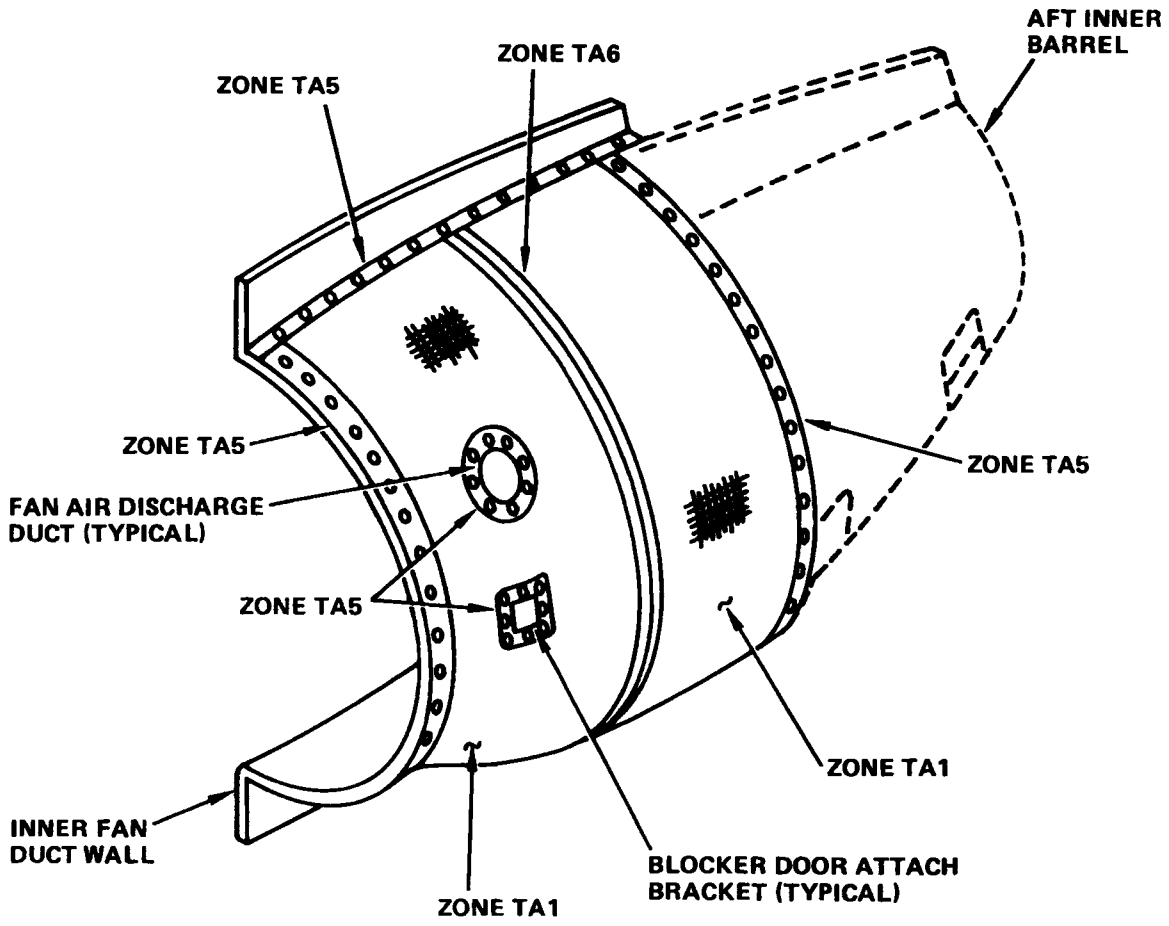
BM5 71 00 00 6 KTMO 00

Inlet Cowl Acoustic Panel Damage Zones
Figure 609



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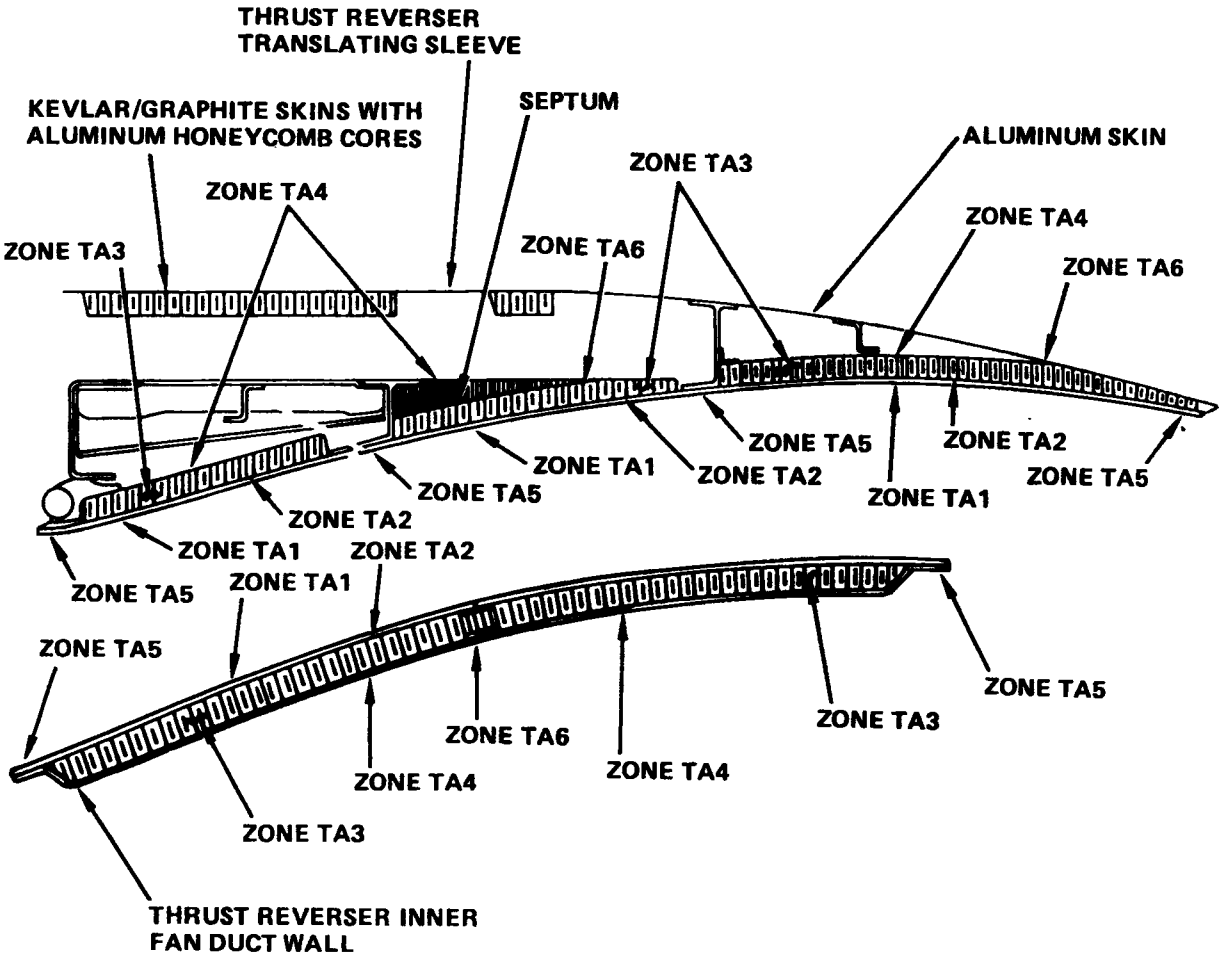
BM5 71 00 00 6 KUM0 00

Inner Fan Duct Wall Acoustic Panel Damage Zones
Figure 610



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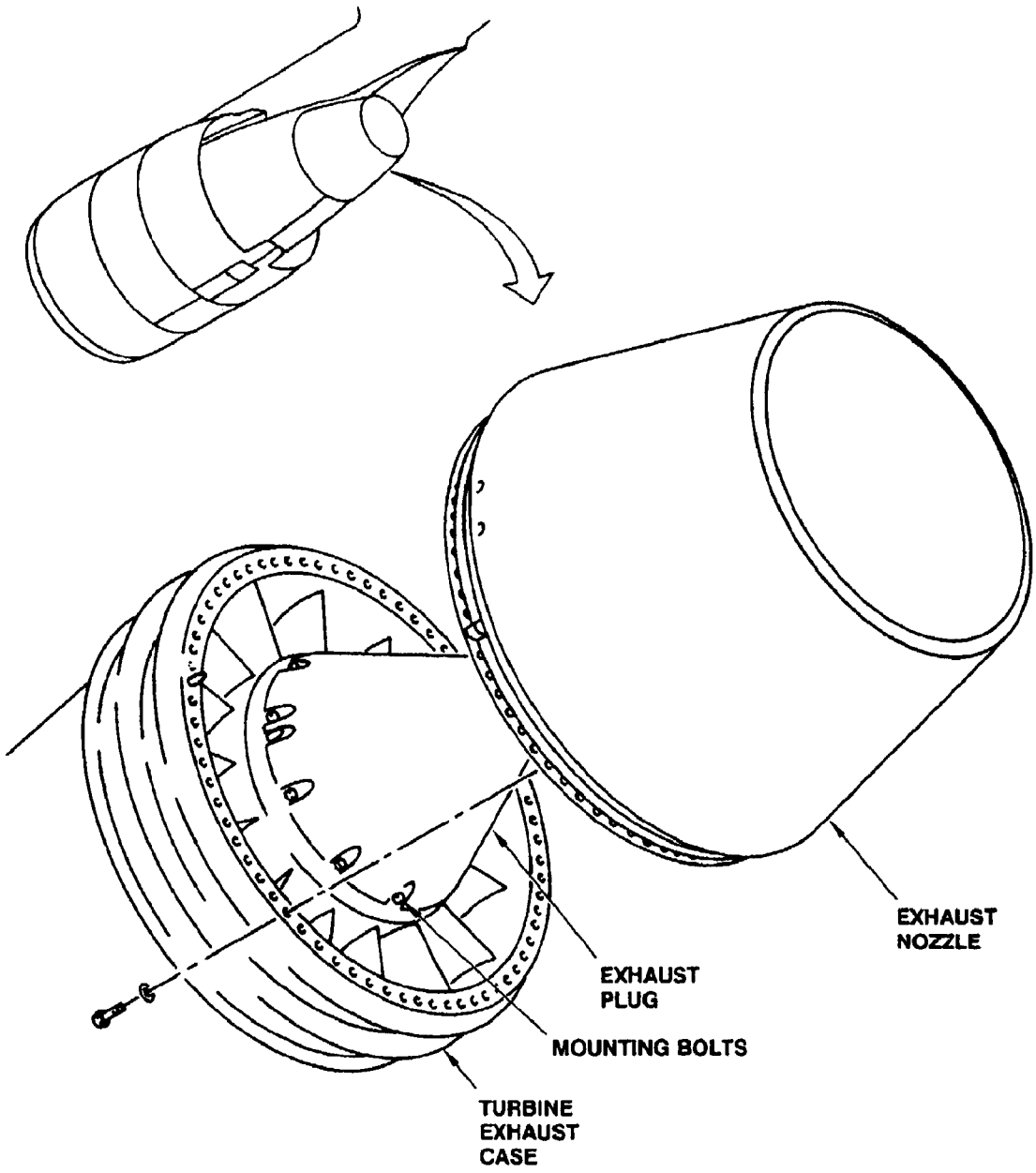
Thrust Reverser Bonded Aluminum Acoustic
Panel Damage Zones
Figure 611

R Nozzle Acoustical Panel and Plug
R Allowable Damage Limits
R Table 606

Damage	Limitations	Disposition
Dent	Maximum depth 0.120 inch (3.048 mm). Maximum length 2.00 inches (50.8 mm). Maximum width 1.00 inch (25.4 mm). Minimum radius 0.25 inch (6.35 mm). No face sheet thinning. Crush core acceptable. No two dents within 3.00 inches (76.2 mm). Minimum 1.50 inch (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Gouge	Maximum depth 0.010 inch (0.254 mm). Maximum length 1.50 inches (38.1 mm). Maximum width 0.10 inch (2.54 mm). Minimum radius 0.05 inch (1.27 mm). Surface penetration only, with radius width. No core crush allowed. No two gouges within 3.00 inches (76.2 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Nick	Maximum depth 0.010 inch (0.254 mm). Maximum length 0.75 inch (19.05 mm). Maximum width 0.10 inch (2.54 mm). No two nicks within 2.00 inches (50.8 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge.	OK for flight if within limits. Inspect 'A' check.
Scratch	Maximum depth 0.005 inch (0.127 mm). Maximum length 1.50 inch (38.1 mm). Maximum width 0.050 inch (1.27 mm). No two scratches within 2.00 inches (50.8 mm). Minimum 1.50 inches (38.1 mm) from honeycomb core edge. Surface penetration only.	OK for flight if within limits. Inspect 'A' check.

Damage	Limitations	Disposition
Crack	No two cracks within 10 inches (254 mm). Minimum separation from reinforced areas 1.0 inch (25.4 mm). Unlimited use of terminated crack between three adjacent fasteners in joint containing at least 10 fasteners. Unlimited use of terminated crack less than 1.0 inch (25.4 mm) long between two adjacent fasteners. No cracks allowed in Nozzle extension, T flange, and attach ring.	OK for flight if within limits. Inspect 'A' check. Stop drill before flight. Repair at next 'C' check.
Thermal Expansion Wear	Maximum wear on T-ring under bolt head footprint 0.045 inch (1.143 mm) at any six bolts. Maximum total wear on both bolt and ring not to exceed 0.045 inch (1.143 mm). Bolt wear limited to 0.020 inch (0.508 mm) on underside of bolt head and 0.030 inch (0.762 mm) on bolt shank.	OK for flight if within limits. Repair at next 'A' check. Replace worn bolts before flight.
Contact wear	Maximum contact wear at finger points of aft pylon seal 0.015 inch (0.381 mm).	OK for flight if within limits. Repair required within 500 flight hours if limits exceeded. Inspect "A" check.
Creep deformation	Visible deformation is acceptable. Maximum deformation less than 1.0 inch (25.4 mm) from nominal surface. Plug thinning is limited to 0.040 inch (1.016 mm).	Inspect at next 'C' check. Replace if necessary at 'C' check.
Hole	Stop drill holes only. Limited to 0.120 inch (3.048 mm) diameter.	Inspect at each 'A' check. Repair at 'C' check.
Disbond	Maximum diameter 2.0 inches	Inspect at each

Damage	Limitations	Disposition
	(50.8 mm). No two disbonds within 10.0 inches (254 mm) of each other. Maximum five disbonds per section. No overlap between face sheets.	'A' check. Repair next 'C' check.
Missing Plug Mounting Bolts	Up to eight bolts can be missing, but no two consecutive.	Replace all missing bolts by next 'A' check



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Exhaust Plug and Nozzle
Figure 612

2. Thrust Reverser Door Drainage Holes

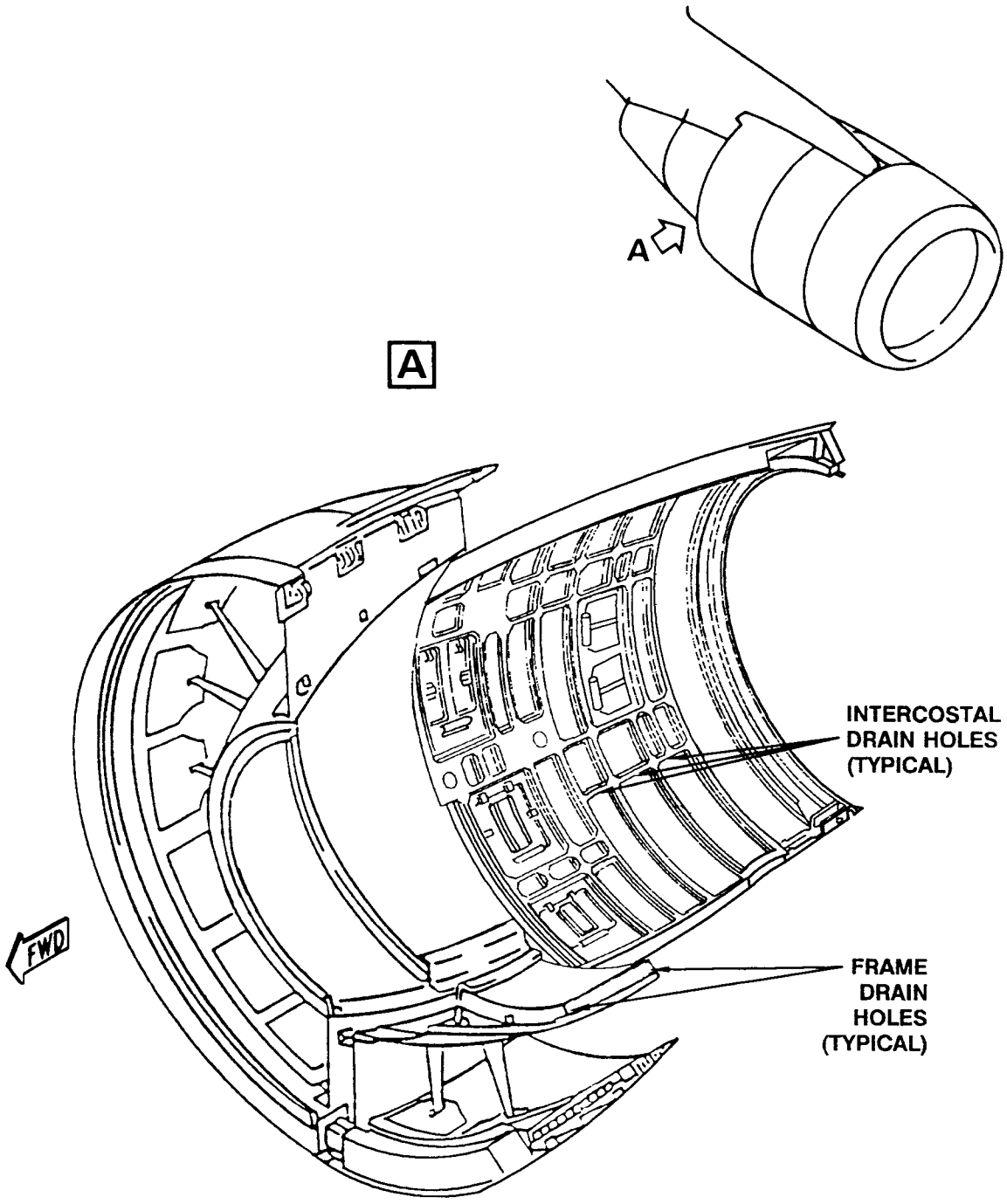
A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Probe
C.	Flashlight
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 613)
CAUTION : BLOCKAGE OF DRAINAGE HOLES IN LONGERONS AND INTERCOSTALS MAY LEAD TO DANGEROUS BUILDUP OF OIL, FUEL OR OTHER COMBUSTIBLE MATERIALS. MAKE SURE THAT DRAIN HOLES ARE FREE OF FOREIGN OBJECTS, SEALANTS, AND ABLATIVE COATINGS. FAILURE TO DO SO MAY CREATE A POTENTIAL FIRE HAZARD IN THE ENGINE/NACELLE COMPARTMENT.
(1)Using flashlight, visually inspect thrust reverser door longeron and intercostal drainage holes (0.375 in. (9.525 mm) diameter) for any signs of blockage.
(2)If any blockage is observed, remove drain hole obstruction with probe and completely clean out drain hole to allow for proper drainage.

D. Close-Up
(1)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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Thrust Reverser Door Drainage Holes
Figure 613

1. Cleaning Requirements After Chemical Contact with Fire Extinguishing Agents, Hydraulic Fluid, Oil or Fuel

A. General

This procedure gives direction on how to clean the engine after chemical contact with fire extinguishing agents, hydraulic fluid, oil or fuel.

B. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 70-00-00, P. Block 201	Engine - Standard Practices

C. Procedure

(1) If necessary, clean the engine to remove fire extinguishing agents, hydraulic fluid, oil or fuel by SPOP 425 (Ref. 70-00-00, P. Block 201).

ENGINE COMPONENT INTERMIX MAINTENANCE PRACTICES

1. General

A. An improved performance package is added to the PW4000 and it is identified by (-3) for engines as built by P&W or for those converted by SB
Example : PW4152 (-3). Changes are made to the internal and external engine parts. Along with the engine changes, the thrust reverser is changed by SB PW4NAC 78-68. A stencil that has the subsequent warning is added near the thrust reverser data plate.

WARNING : INTENT OF SERVICE BULLETIN PW4 NAC 78-68 HAS BEEN INCORPORATED ON THIS THRUST REVERSER AT PRODUCTION OR AS A FIELD REWORK.
SIGNIFICANT FLIGHT OPERATIONAL INTERMIX CONCERNS EXIST BETWEEN ENGINES AND THRUST REVERSERS WITH SERVICE BULLETIN PW4 NAC 78-68 INCORPORATED. SEE AIRCRAFT MAINTENANCE MANUAL CHAPTER 71-00-10 PRIOR TO ENGINE OR THRUST REVERSER INSTALLATION.

B. Intermix of engines on the aircraft is allowed under some conditions. The subsequent instructions must be used to do the maintenance to make sure that the approved engine is put on the aircraft (Ref. Fig. 201).
CAUTION : MAKE SURE THAT THE APPROVED ENGINE IS INSTALLED ON THE AIRCRAFT.

ENGINE MODEL REMOVED FROM AIRCRAFT	REPLACE WITH
PW4152	REF. TABLE 201
PW4152 (-3)	REF. TABLE 202
PW4156A	REF. TABLE 203
PW4156A (-3)	REF. TABLE 204
PW4158	REF. TABLE 205
PW4158 (-3)	REF. TABLE 206

CAUTION : IF YOU REMOVE A THRUST REVERSER YOU MUST INSTALL A SAME TYPE THRUST REVERSER. YOU CAN ALSO INSTALL A THRUST REVERSER, PRE OR POST SB PW4NAC 78-68, TO ALIGN WITH ENGINES GIVEN IN TABLES 201 THROUGH 206.

2. Engine/Thrust Reverser Intermix

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HARDWARE AND SOFTWARE DEFINITION FOR AUTHORIZED PROPULSION SYSTEMS

ENGINE (FAN + GAS GENERATOR + ENG PROGRAM. PLUG + ENGINE DATA PLATE)	THRUST REVERSER COWLS + T/R DATA PLATE + STENCIL	PROPULSION SYSTEM CONFIGURATION (ENGINE DATA PLATE INDICATION)	PW4152		PW4156A		PW4158	
			FOR ENGINES WITH 2.95 PROBES	FOR ENGINES THAT DO NOT HAVE 2.95 PROBES	FOR ENGINES WITH 2.95 PROBES	FOR ENGINES THAT DO NOT HAVE 2.95 PROBES	FOR ENGINES WITH 2.95 PROBES	FOR ENGINES THAT DO NOT HAVE 2.95 PROBES
PRODUCTION PHASE I ENGINE	PHASE I T/R COWLS	CONF. PHASE I (PW41XX)	CURRENT PHASE I EPP's	CURRENT PHASE I EPP's	CURRENT PHASE I EPP's	CURRENT PHASE I EPP's	CURRENT PHASE I EPP's	CURRENT PHASE I EPP's
PRODUCTION PHASE III ENGINE OR CONVERTED PHASE III ENGINE	PRODUCTION PHASE III T/R COWLS OR PHASE I T/R COWLS REWORKED PER SB's PW4NAC 78-68 AND PW4NAC 78-74	CONF. 3 (PW41XX (-3))	54D333	54D333	54D335	54D335	54D360	54D360
PRODUCTION PHASE III ENGINE OR CONVERTED PHASE III ENGINE REWORKED PER SB PW4ENG 73-150 (FAN AND GAZ GENERATOR PHASE III)	PHASE I T/R COWLS	CONF. 3A (PW41XX (-3A))	54D332	54D332	54D337	54D337	54D361	54D361
PHASE I ENGINE REWORKED PER SB PW4ENG 72-516 (FAN PHASE III WITH GAZ GENERATOR PHASE I)	PRODUCTION PHASE III T/R COWLS OR PHASE I T/R COWLS REWORKED PER SB's PW4NAC 78-68 AND PW4NAC 78-74	CONF. 1E (PW41XX (-1C/-1E))	54D331	54D331	54D336	54D336	54D339	54D339
	PHASE I T/R COWLS	CONF. 1C (PW41XX (-1C/-1E))						

SB PW4ENG 73-149 SB TO INSTALL FADEC/EEC SCN 11/Z
SB PW4ENG 73-150 SB TO INSTALL EPP (-3A) AND ENGINE DATA PLATE [ENGINE IDENTIFIER (-3A)]
SB PW4ENG 72-516 SB TO INSTALL FAN ØIII , EPP (-1C/-1E) AND ENGINE DATA PLATE [ENGINE IDENTIFIER (-1C/-1E)]
SB PW4NAC 78-68 SB TO REWORK ØI T/R COWLS, TO REIDENTIFY T/R DATA PLATE AND ADD WARNING STENCIL
SB PW4NAC 78-74 SB TO REWORK ØI T/R COWLS IN ORDER TO IMPROVE SEALING
SB PW4ENG 72-572 SB TO CONVERT ØI ENGINE TO ØIII ENGINE CONFIGURATION
SB PW4NAC 71-139 SB TO REPLACE THE ENGINE CORE BRACKETS AND DUCT ASSEMBLY

NOTE : THE FULL PHASE III AND THE HYBRID PROPULSION SYSTEMS MUST HAVE THE FADEC SCN 11/Z (SB PW4ENG 73-149) OR NEXT ONE.

CAUTION : THERE ARE TWO TYPES OF THRUST REVERSER CONFIGURATIONS LISTED IN TABLES 201 THROUGH 206.
IF THRUST REVERSER IS POST SB PW4NAC 78-68, THEN FAN BLADES (PN 54A821) MUST BE INSTALLED IN THE ENGINE.
USE OF PRIOR CONFIGURATION FAN BLADES WITH A POST SB PW4NAC 78-68 THRUST REVERSER CAN RESULT IN A REDUCTION OF AVAILABLE FRONT COMPRESSOR SURGE MARGIN AND FAN STALL MARGIN WHICH COULD CAUSE FAN BLADE FRACTURE AND SURGE PROBLEMS.

A. You must know if the thrust reverser on the aircraft is Pre or Post SB PW4NAC 78-68. This can be determined by the stencil near the thrust reverser data plate.

B. You must know what parts are in the engine you schedule to install. This can be determined by the data shown in Table 201 through 206.
Example : If the removed engine is a PW4152 and the thrust reverser on the aircraft does not include SB PW4NAC 78-68, you can install engines per Table 201.
If the removed engine is a PW4152 (-3), the thrust reverser on the aircraft will include SB PW4NAC 78-68. The only engines you can install are shown in Table 202.

C. See the following for exact engine/thrust reverser requirements.
(1)PW4152 powered aircraft without the intent of SB PW4NAC 78-68 thrust reversers.
Allowable engine configurations for Pre SB PW4NAC 78-68 thrust reversers.

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4152	NONE	54D330(1)	NONE
R	4152	(-1C/1E)	54D331(1)	- SB PW4ENG 72-516
R	4152	(-3A)	54D332(1)	- SB PW4ENG 73-150

R (1) FOR ENGINES WITH OR WITHOUT 2.95 PROBE

PW4152 Powered Aircraft without
SB PW4NAC 78-68
Table 201

(2)PW4152 powered aircraft with the intent of SB PW4NAC 78-68 thrust reversers.
Allowable engine configurations for Post SB PW4NAC 78-68 thrust reversers.

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4152	(-3)	54D333(1)	CONVERSION SB PW4ENG 72-572

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4152	(-1C/1E)	54D331(1)	- SB PW4ENG 72-516

R (1) FOR ENGINES WITH OR WITHOUT 2.95 PROBE

PW4152 Powered Aircraft with
SB PW4NAC 78-68
Table 202

(3)PW4156A powered aircraft without the intent of SB PW4NAC 78-68 thrust reversers.
Allowable engine configurations for Pre SB PW4NAC 78-68 thrust reversers.

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4156A	NONE	54D334(1)	NONE
R	4156A	(-1C/1E)	54D336(1)	- SB PW4ENG 72-516
R	4156A	(-3A)	54D337(1)	- SB PW4ENG 73-150

R (1) FOR ENGINES WITH OR WITHOUT 2.95 PROBE

PW4156A Powered Aircraft without
SB PW4NAC 78-68
Table 203

(4)PW4156A powered aircraft with the intent of SB PW4NAC 78-68 thrust reversers.
Allowable engine configurations for Post SB PW4NAC 78-68 thrust reversers.

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4156A	(-3)	54D335(1)	CONVERSION SB
R				PW4 ENG 72-572
R	4156A	(-1C/1E)	54D336(1)	- SB PW4ENG 72-516

R 4(1) FOR ENGINES WITH OR WITHOUT 2.95 PROBE

PW4156A Powered Aircraft with
SB PW4NAC 78-68
Table 204

(5)PW4158 powered aircraft without the intent of SB PW4NAC 78-68 thrust reversers.

Allowable engine configurations for Pre SB PW4NAC 78-68 thrust reversers.

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4158	NONE	54D338(1)	NONE
R	4158	(-1C/1E)	54D339(1)	- SB PW4ENG 72-516
R	4158	(-3A)	54D361(1)	- SB PW4ENG 73-150

R (1) FOR ENGINES WITH OR WITHOUT 2.95 PROBE

PW4158 Powered Aircraft without SB PW4NAC 78-68
Table 205

(6)PW4158 powered aircraft with the intent of SB PW4NAC 78-68 thrust reversers.
Allowable engine configurations for Post SB PW4NAC 78-68 thrust reversers.

	ENGINE MODEL	ENGINE PLATE IDENTIFIER SUFFIX	EEC PLUG	REFERENCE SB
R	4158	(-3)	54D360(1)	CONVERSION SB
R				PW4ENG 72-572
R	4158	(-1C/1E)	54D339(1)	- SB PW4ENG 72-516

R (1) FOR ENGINES WITH OR WITHOUT 2.95 PROBE

PW4158 Powered Aircraft with SB PW4NAC 78-68
Table 206

D. Configurations other than those provided by Step C.(1). Through Step C.(6) are not permissible.

EXTERNAL TUBING - INSPECTION/CHECK

1. General

A. This section provides procedure of inspection and replacement or adjustment as necessary of various clamps, brackets, and tubes in the fuel, oil, and hydraulic systems.

B. Reason For the Job
(1)Objective : To improve the reliability and durability of the PW4000 series engine external tubes, brackets, and clamps by utilizing periodic detailed inspection of these parts.
(2)Situation : Deterioration of the tubes, brackets, and clamps on the PW4000 series engine, if undetected and uncorrected, could result in excessive wear of the parts and possibly result in revenue service delay/ cancellations, inflight shutdowns, and premature engine removals.
(3)Cause : Deterioration of the tubes, brackets, and clamps can occur due to any one of several causes : close conditions, hard interferences, high environmental temperatures, high vibration, or incomplete assembly. Any single cause or a combination of any of these causes could result in accelerated distress of the affected hardware.

2.Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

3.Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. General
Early replacement of worn or broken clamps, in particular, is crucial in preventing chafed tubes, which can lead to subsequent breakage with loss of oil and/or fuel. Particularly, inspect loop clamps for mesh compacting or deterioration, clamp drooping or distress, or broken clamps. Replace broken loop clamps or those with mesh missing or worn away. Cracks in rubber silicone clamps or chunking of rubber are indications of clamp wear. An observation of reddish powder around a rubber clamp signals clamp deterioration. If clamps are removed, check for chafing on the tube at that location. Check that the clamp is square to the tube. If clamp is cocked, remove the clamp and check the tube for wear. Replace broken or worn loop clamps with new "soft" cushion clamps, if available. The new clamps, PN ST1540 Series, incorporate a thicker steel band which is more flexible and exhibits a longer fatigue life. Interchangeability with the old clamp, PN ST1435 Series, is not affected. Inspect bracket surfaces for cracks, nicks, or gouges indicating an interference or contact problem.

Inspect weld areas for cracks. Inspect tubes, particularly in the area around the braze joints that hold the ferrules or end fittings to the tubes. Look for discoloration, distress, or other signs of vibratory motion or incipient cracks. Inspect for evidence of tube chafing, wear, and for proper location and amount of clamps.

C. Air System - High Pressure Compressor Bleed Valve Solenoid.

NOTE : The following inspection applies to those engines which do not incorporate SB No. PW4ENG 75-37, and SB No. PW4ENG 75-41.

(1)Inspect the three bleed valve supply tube assemblies as follows : very carefully inspect the area around the braze joints that hold the ferrules or end fittings to the tubes. Look for discoloration, distress, or other signs of vibratory motion or incipient cracks. Remove and replace as necessary.
(Ref. Fig. 601)

(2)Inspect loop clamp on bleed valve supply tube assembly for distress. Replace if broken or distorted.
(Ref. Fig. 602)

D. Fuel System - Fuel Supply Tube

NOTE : The following inspection applies to those engines which do not incorporate SB No. PW4ENG 73-63.

(1)Inspect for a broken clamp and chafed main fuel line around clamp.
(Ref. Fig. 603)

E. Hydraulic System - Presure and Return Tubes

NOTE : The following inspection applies to those engines which do not incorporate a modification that precludes hydraulic system failure.

(1)Inspect for broken clamp on the hydraulic line to the 2.5 bleed actuator.
(Ref. Fig. 604)

(2)Inspect for broken clamp and bracket on hydraulic pressure and return manifold lines and on the oil cooler inlet return line.
(Ref. Fig. 605)

(3)Inspect for cracked bracket supporting mass flowmeter.
(Ref. Fig. 606)

(4)Inspect clamps on hydraulic pressure and return lines.
(Ref. Fig. 607)

F. Lubrication System - Main Oil Line

NOTE : The following inspection applies to those engines which do not incorporate SB No. PW4ENG 79-36.

(1)Inspect main oil line for broken, worn clamps and brackets. Look for evidence of tube chafing. Wear sleeves should be installed at locations 4 and 5, with back to back clamps on the No. 4 bearing scavenge line and the main oil line. Check for wear on both lines.
(Ref. Fig. 608)

(2)Inspect bracket, on the diffuser case and the attaching bolts which hold the main oil line (with wear sleeve) to the engine.
(Ref. Fig. 608, 609)

(3)Inspect the No. 3 bearing main oil pressure tube for broken clamps.

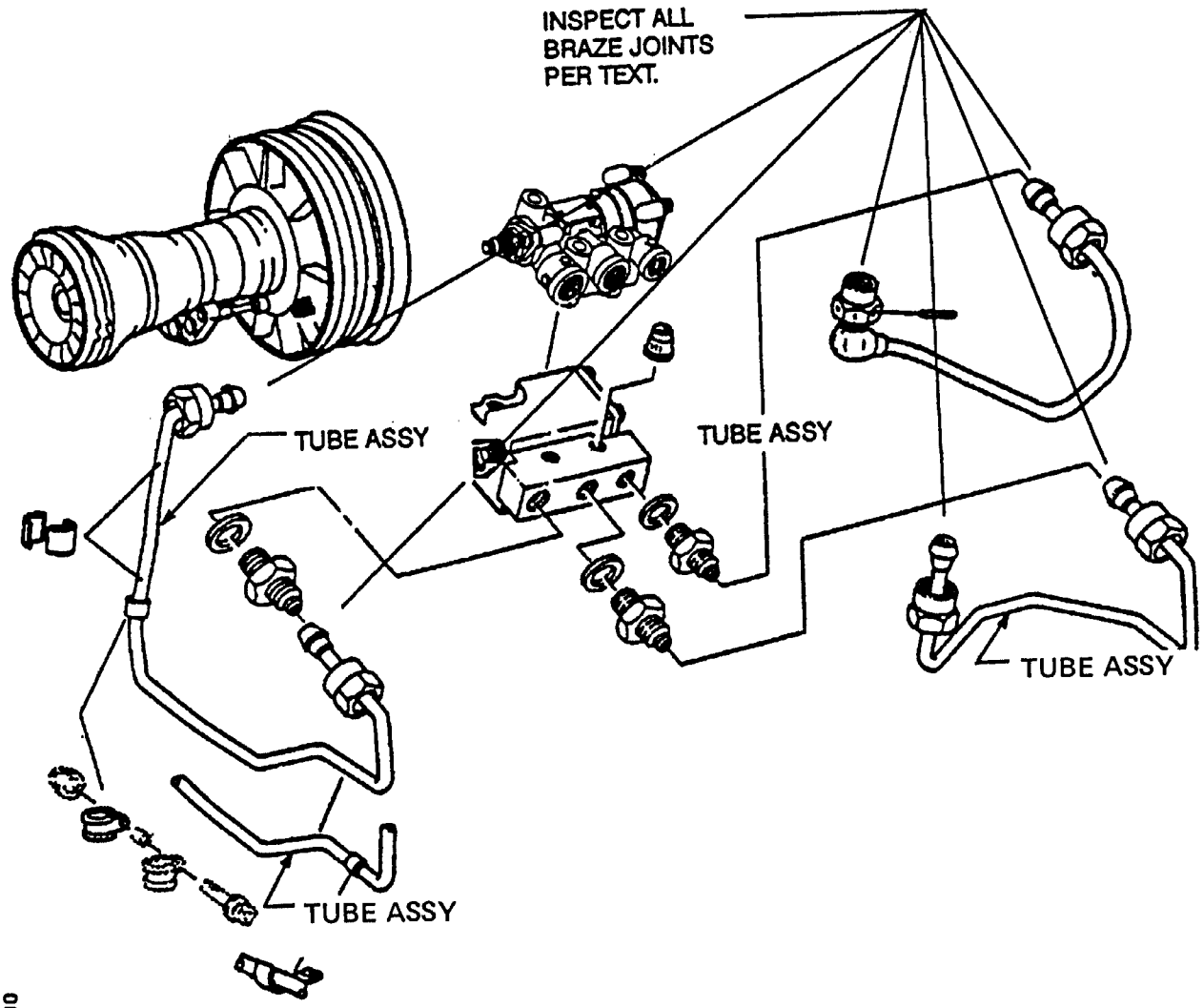
(Ref. Fig. 610)

(4)Inspect the main bearing pressure tube for broken clamps.
(Ref. Fig. 611)

G. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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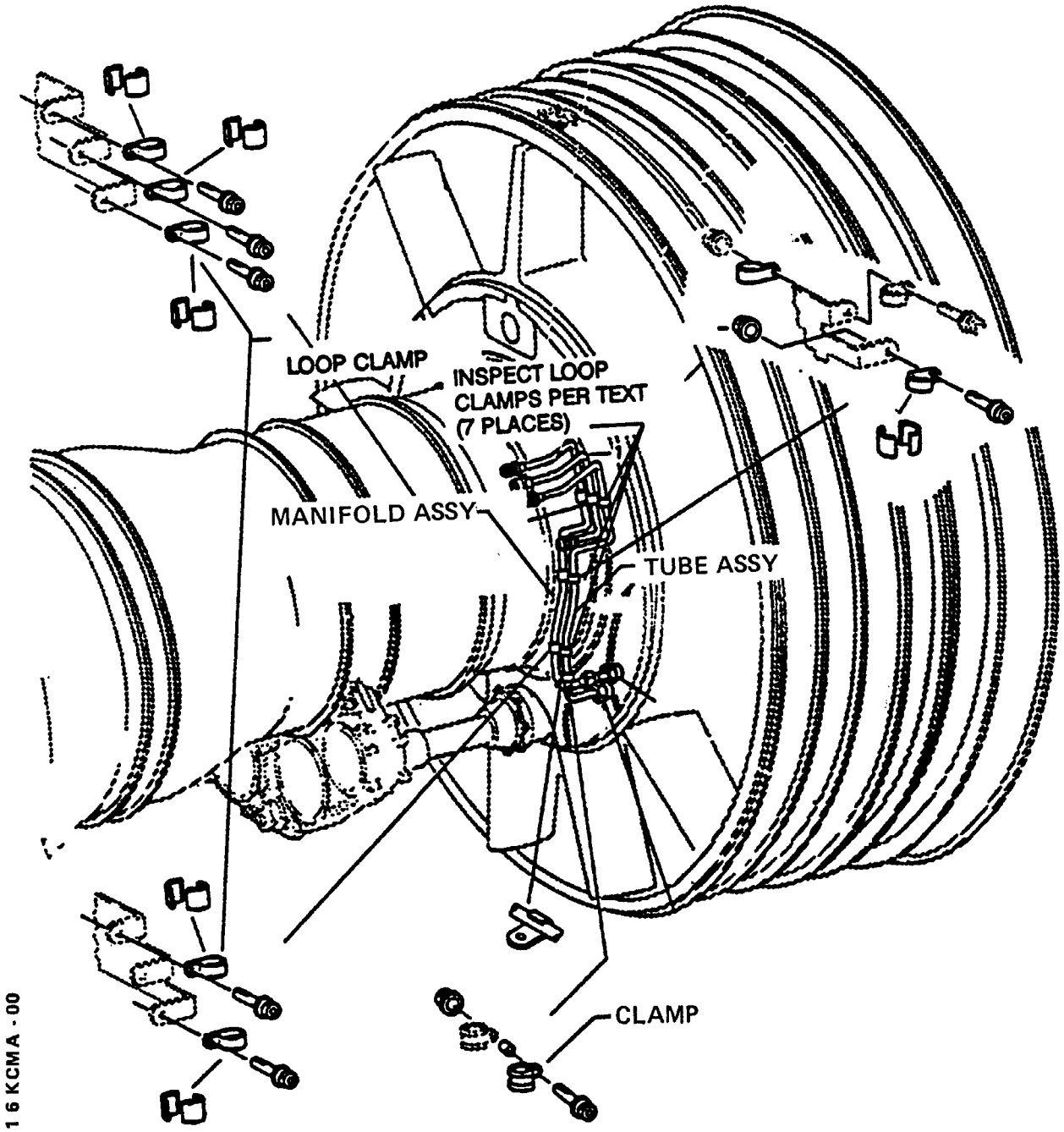
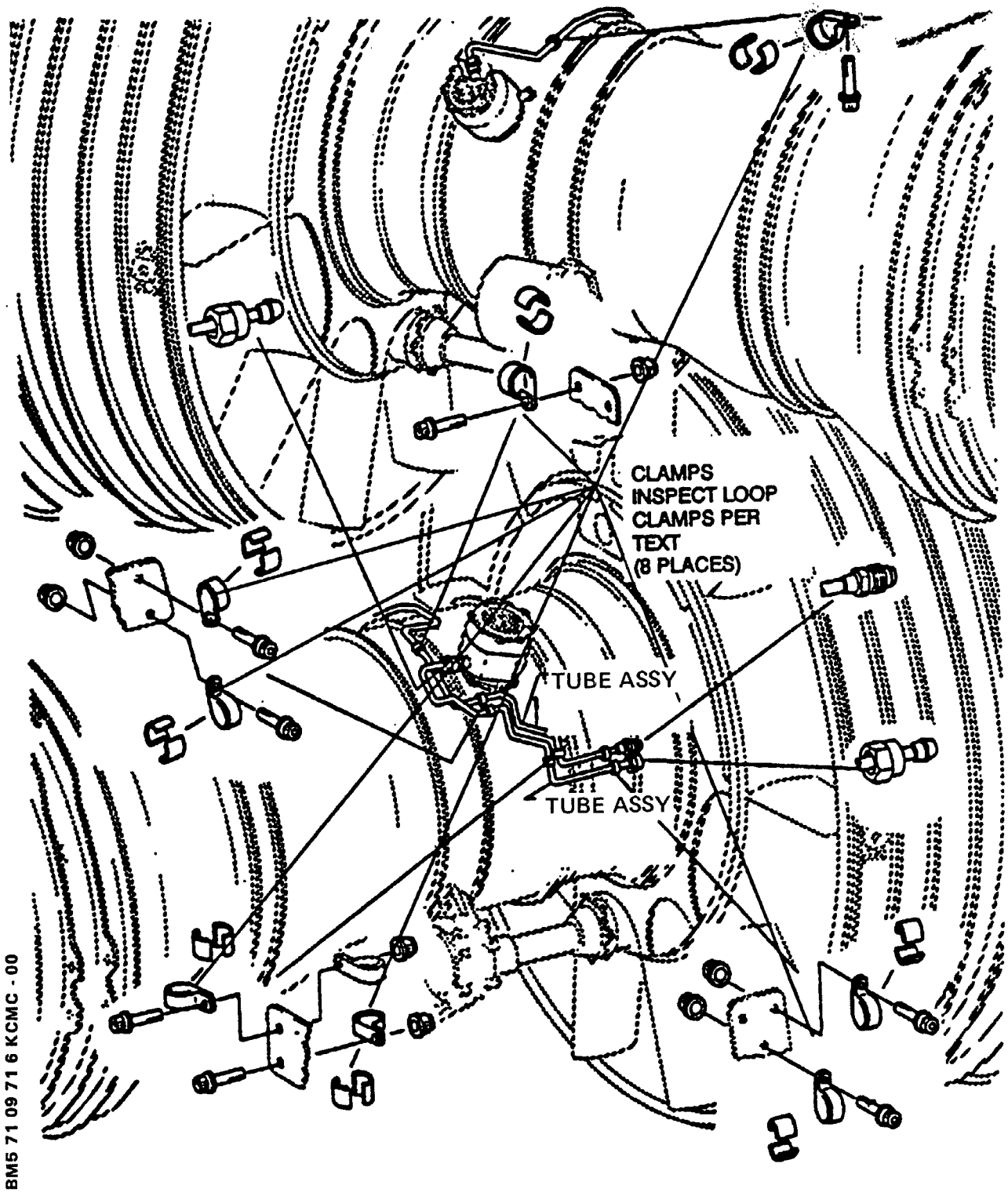
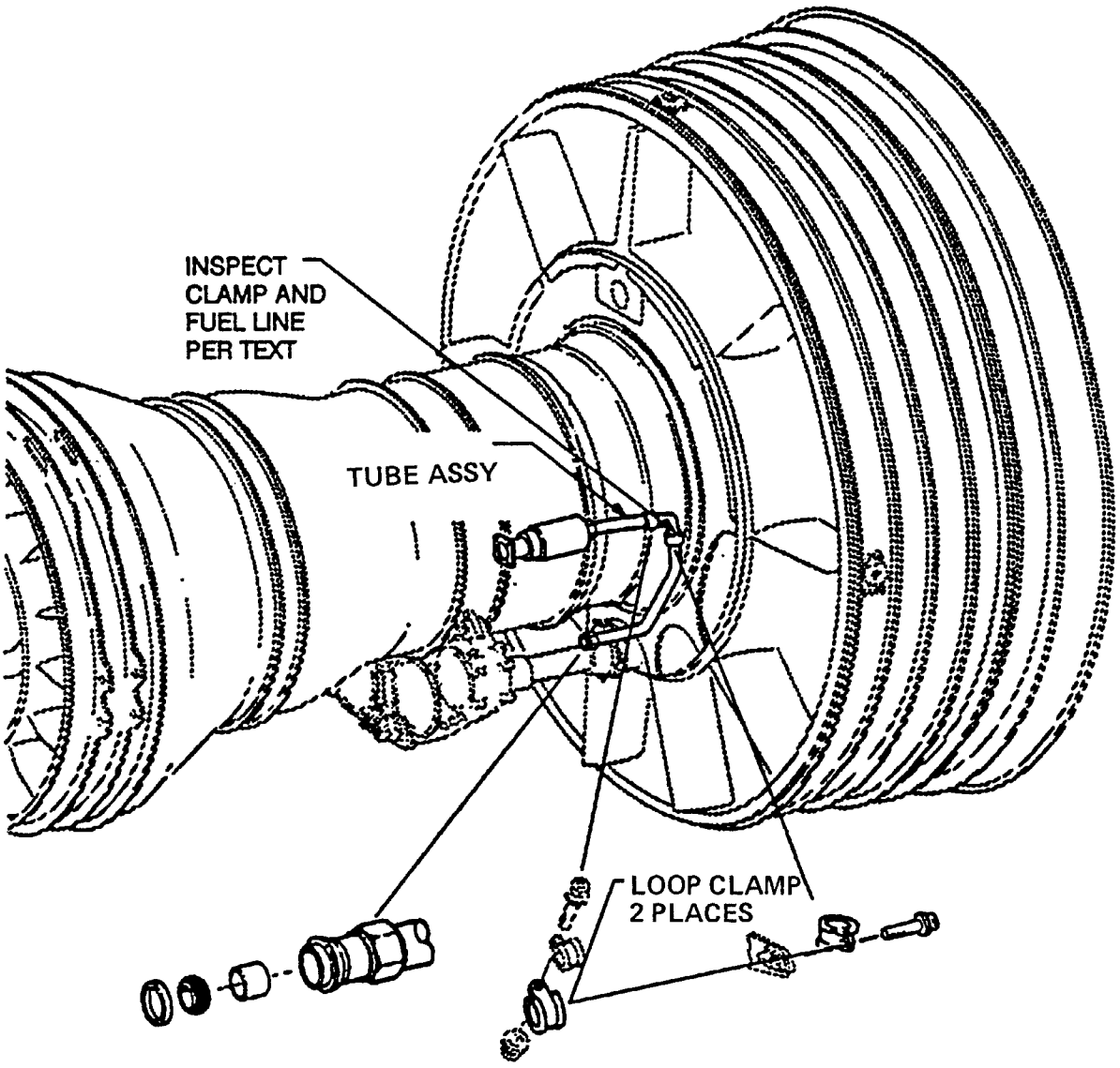
Location Of High Pressure Compressor Bleed
Solenoid Tubes
Figure 601



Location Of Clamps For Bleed Valve Tube And Manifod (Sheet 1/2)
Figure 602



Location Of Clamps For Bleed Valve Supply Tubes (Sheet 2/2)
Figure 602



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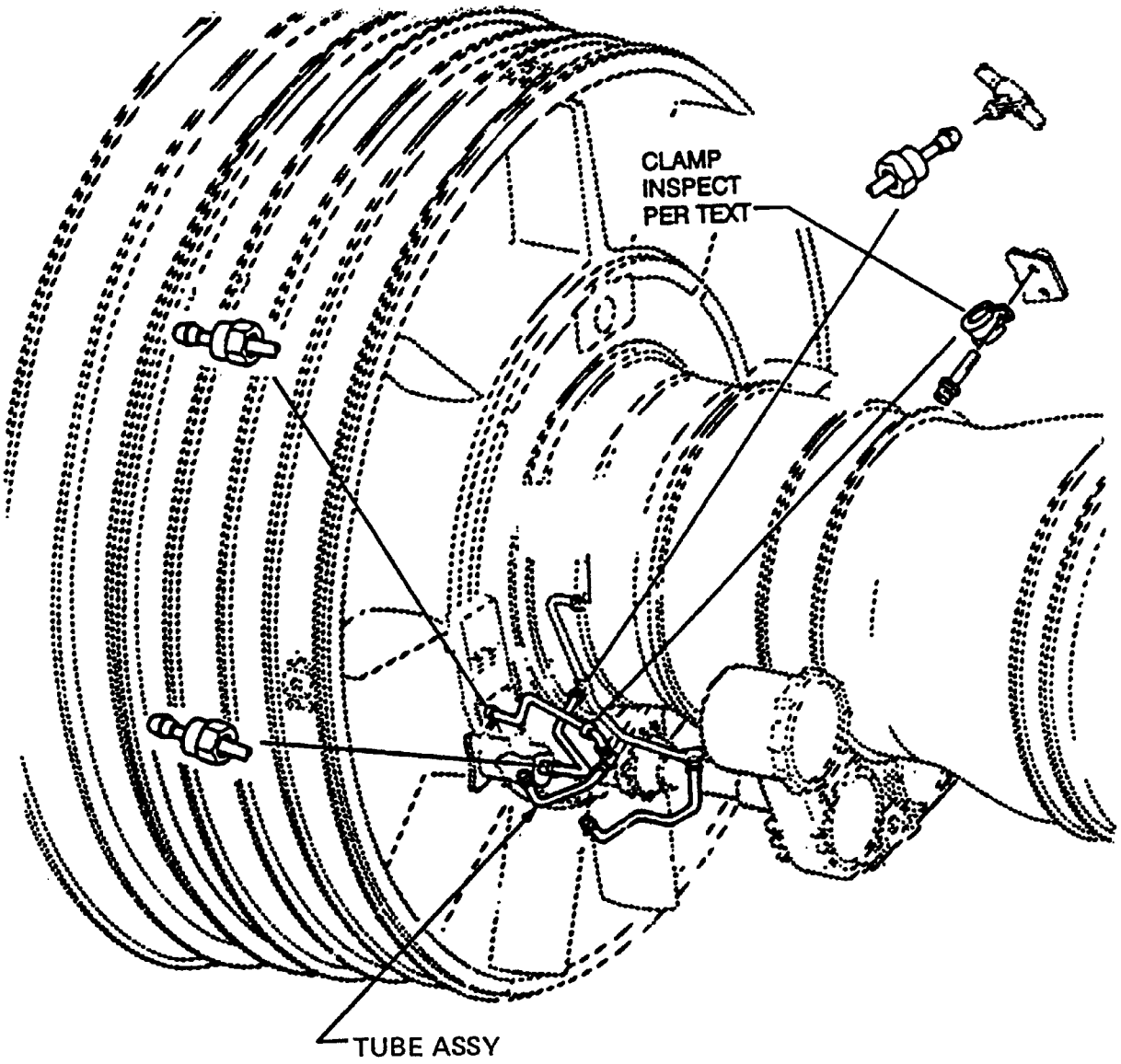
Location Of Clamps For Fuel Distribution Valve
Supply Tube
Figure 603



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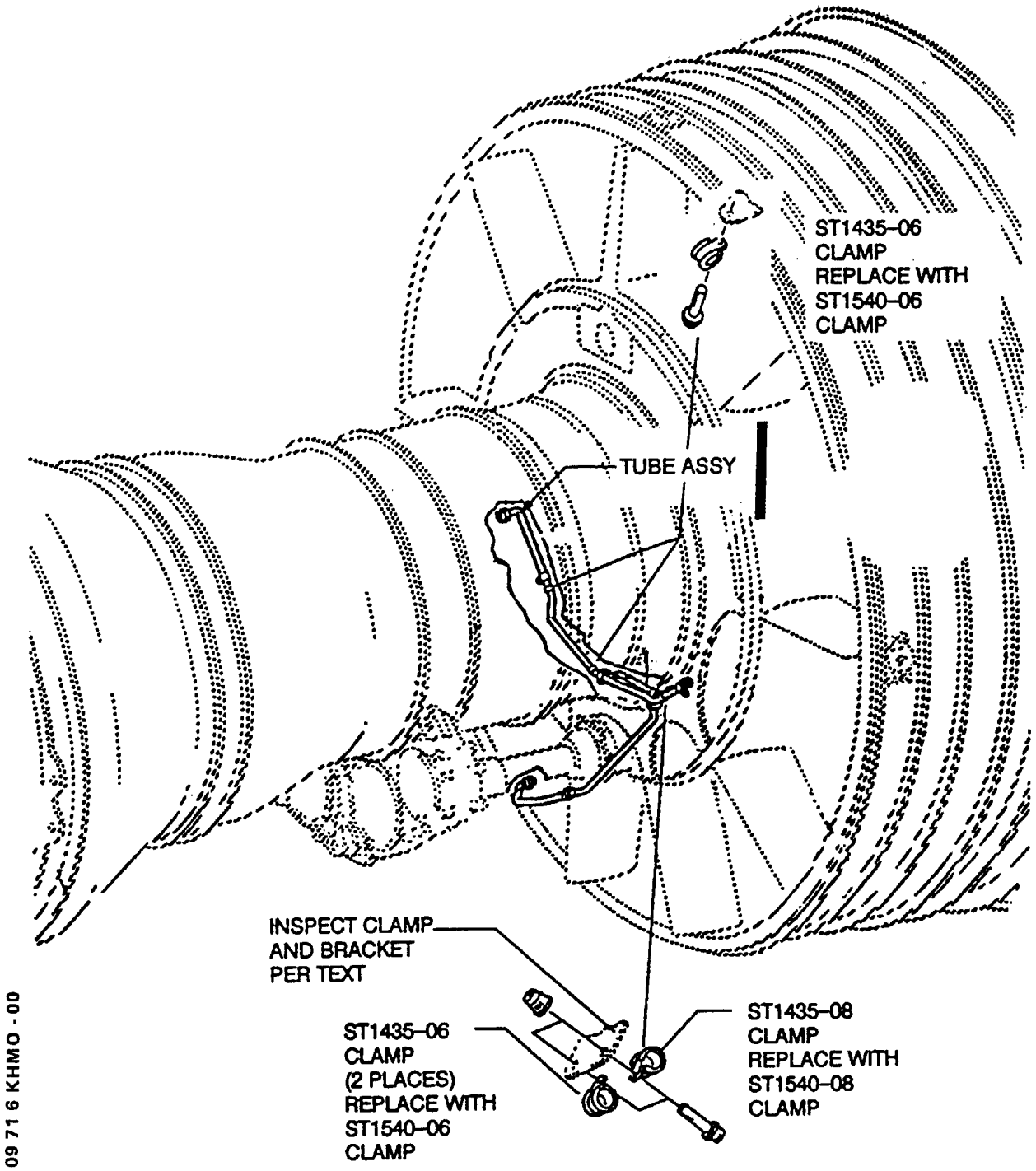
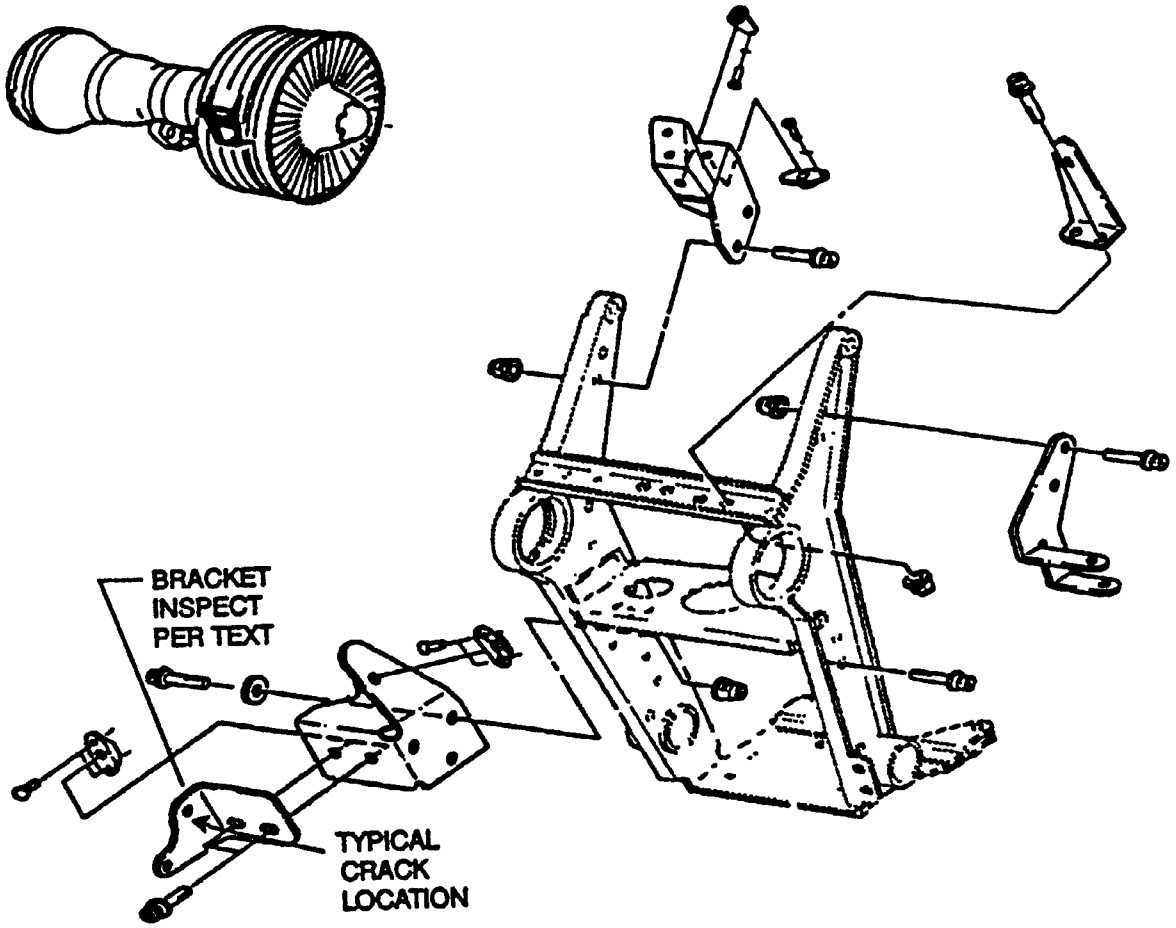
Location Of Clamps For Hydraulic Pressure
Return Tubes
Figure 604



Location Of Clamps For Hydraulic Pressure And Return Manifold
Figure 605



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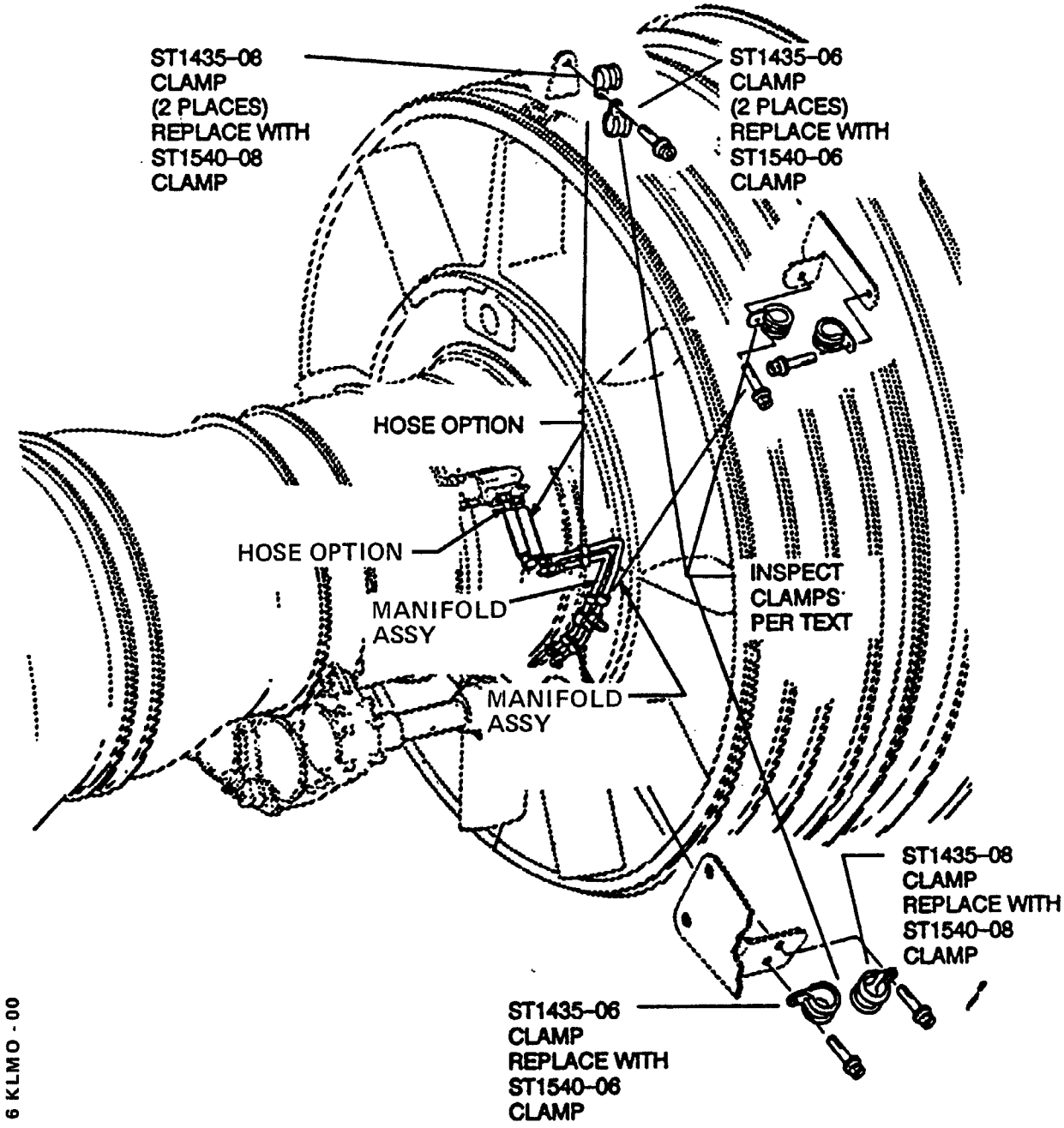
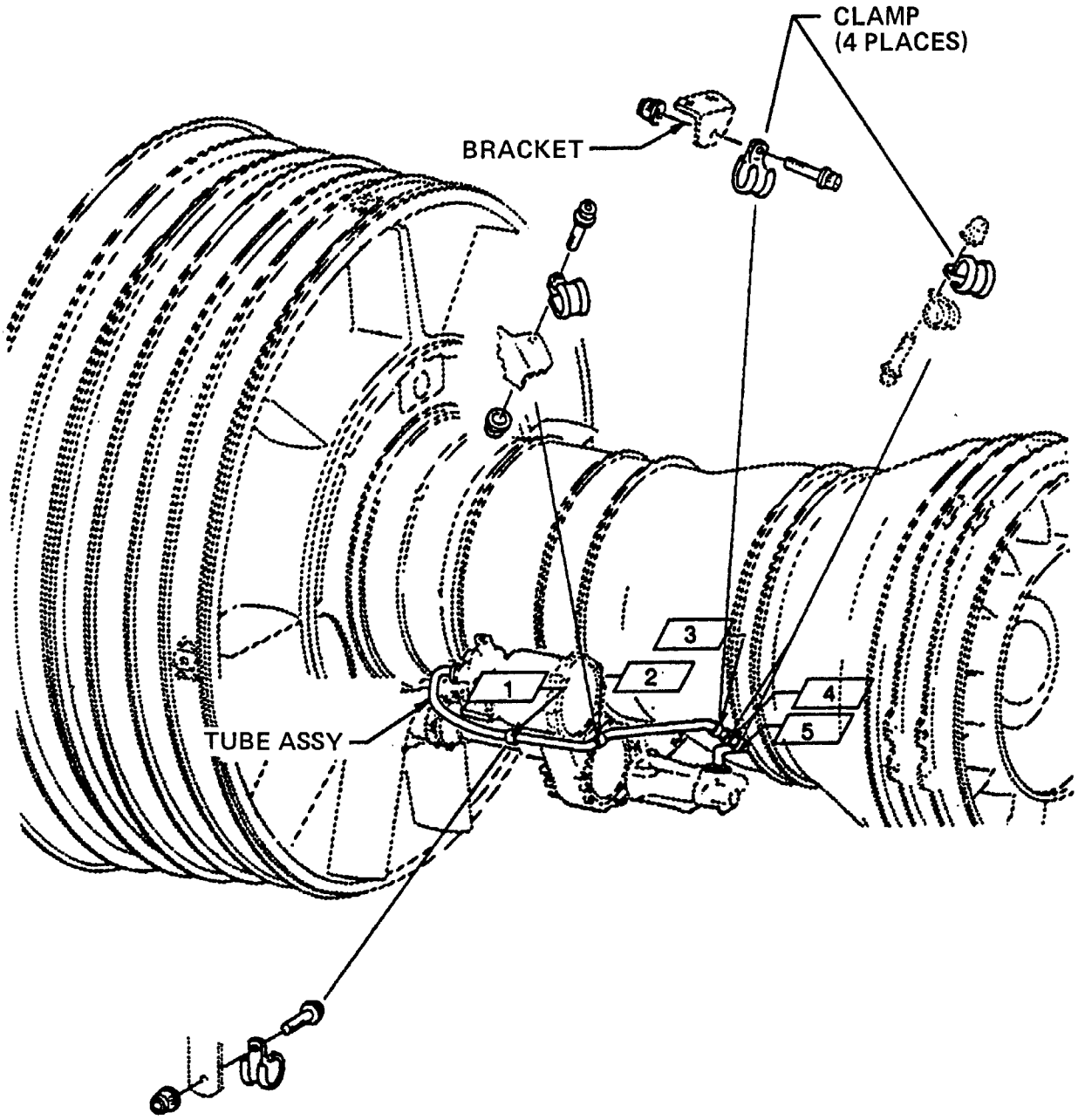
Location Of Bracket Assembly For The Compressor Stator Lever
Figure 606



Location Of Clamps For Hydraulic Pressure And Return Manifolds
Figure 607



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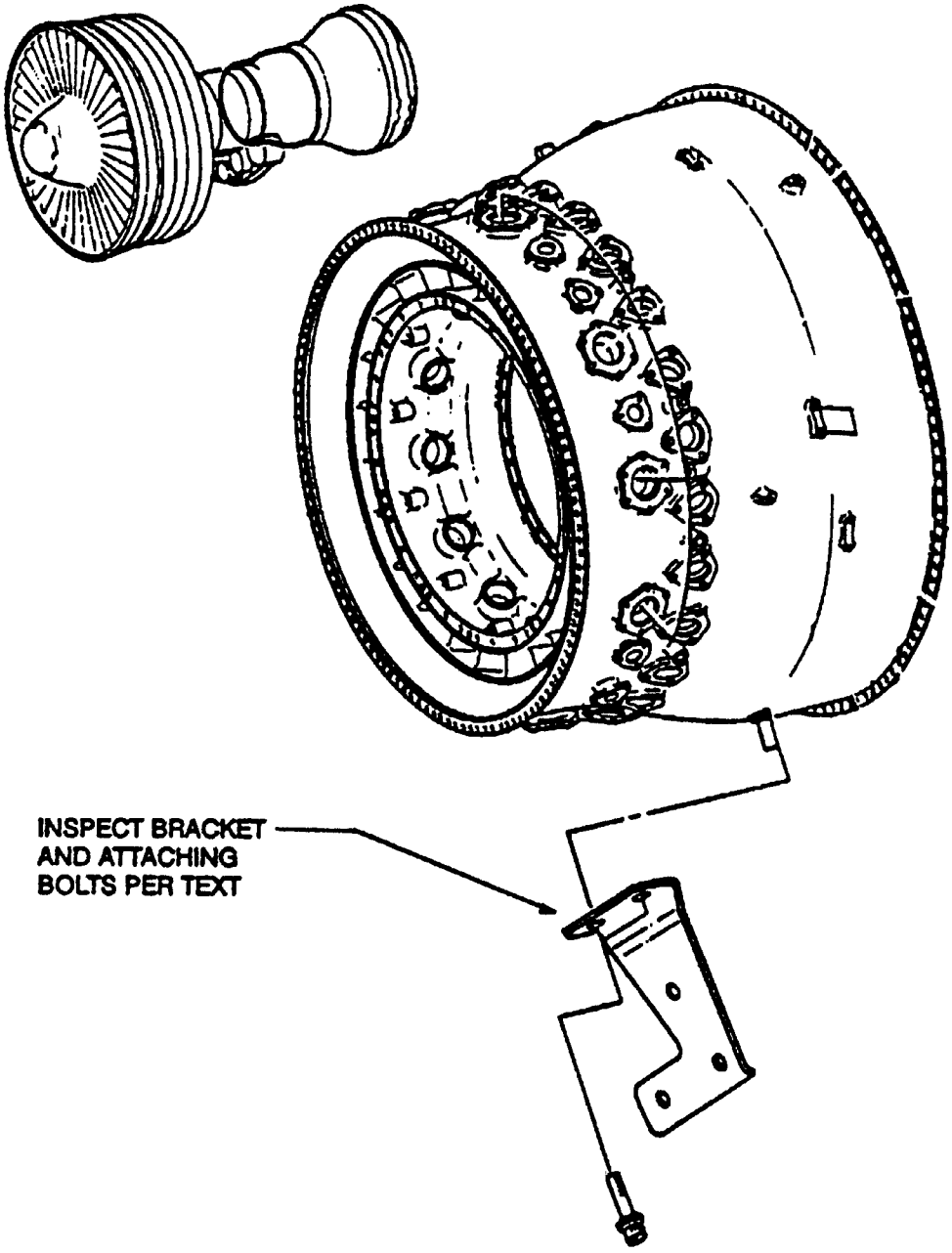
Location Of Clamps For Main Oil Filter Tube
Figure 608



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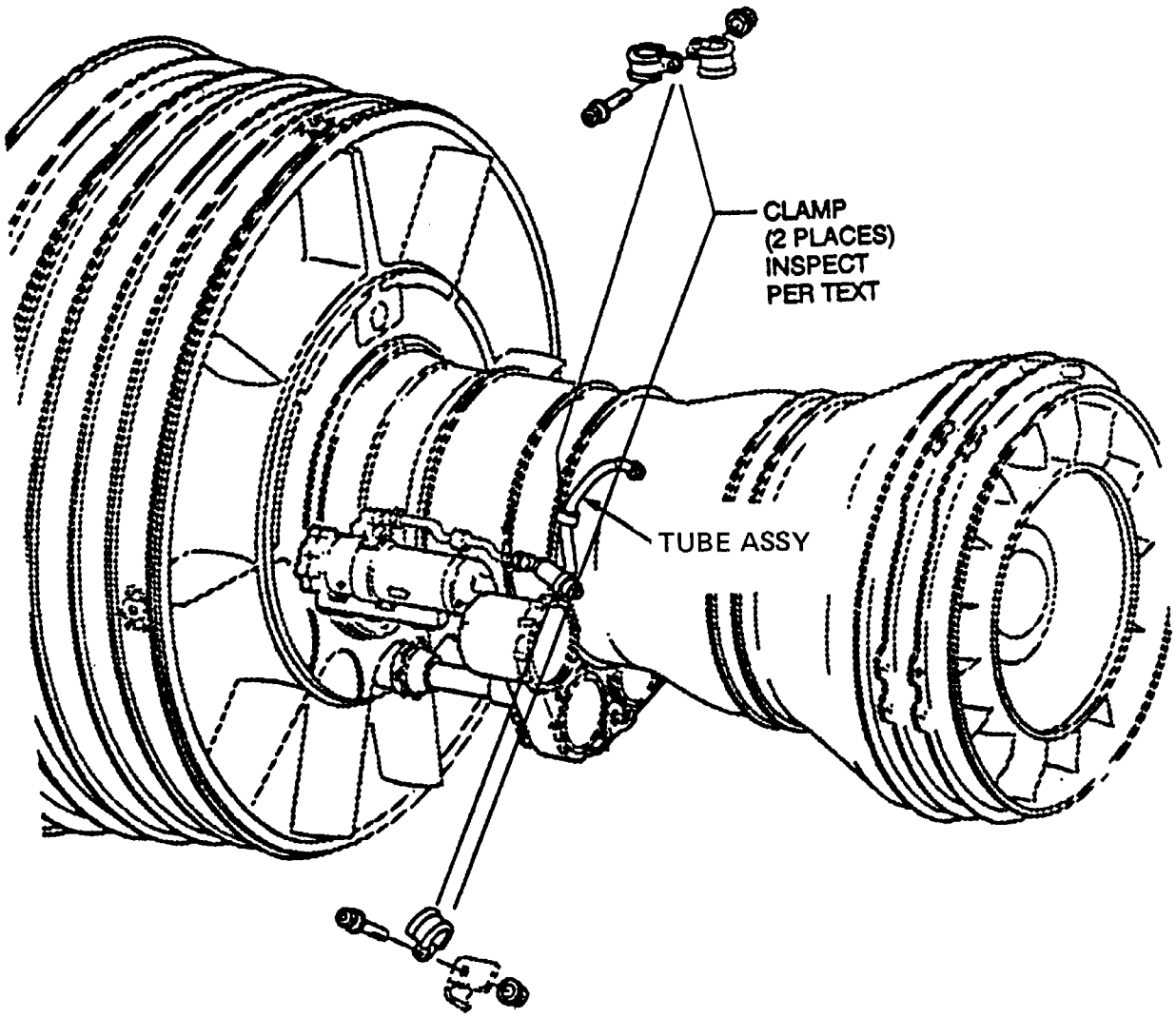
Location Of Bracket On Diffuser Case
Figure 609



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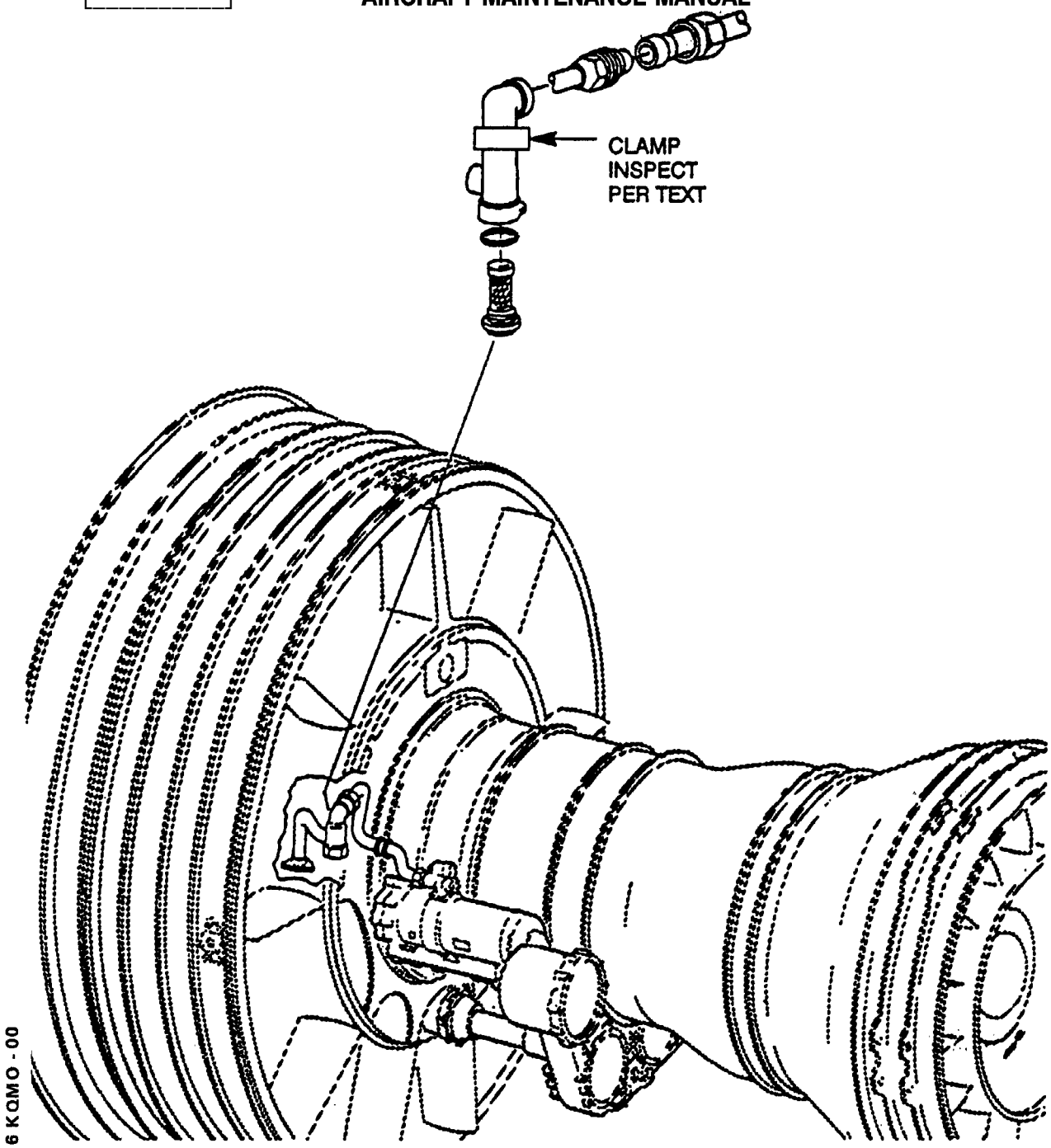
Location Of Clamps For Tube Assembly
Figure 610



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Location Of Clamps For Main Bearing Connector Tube
Figure 611

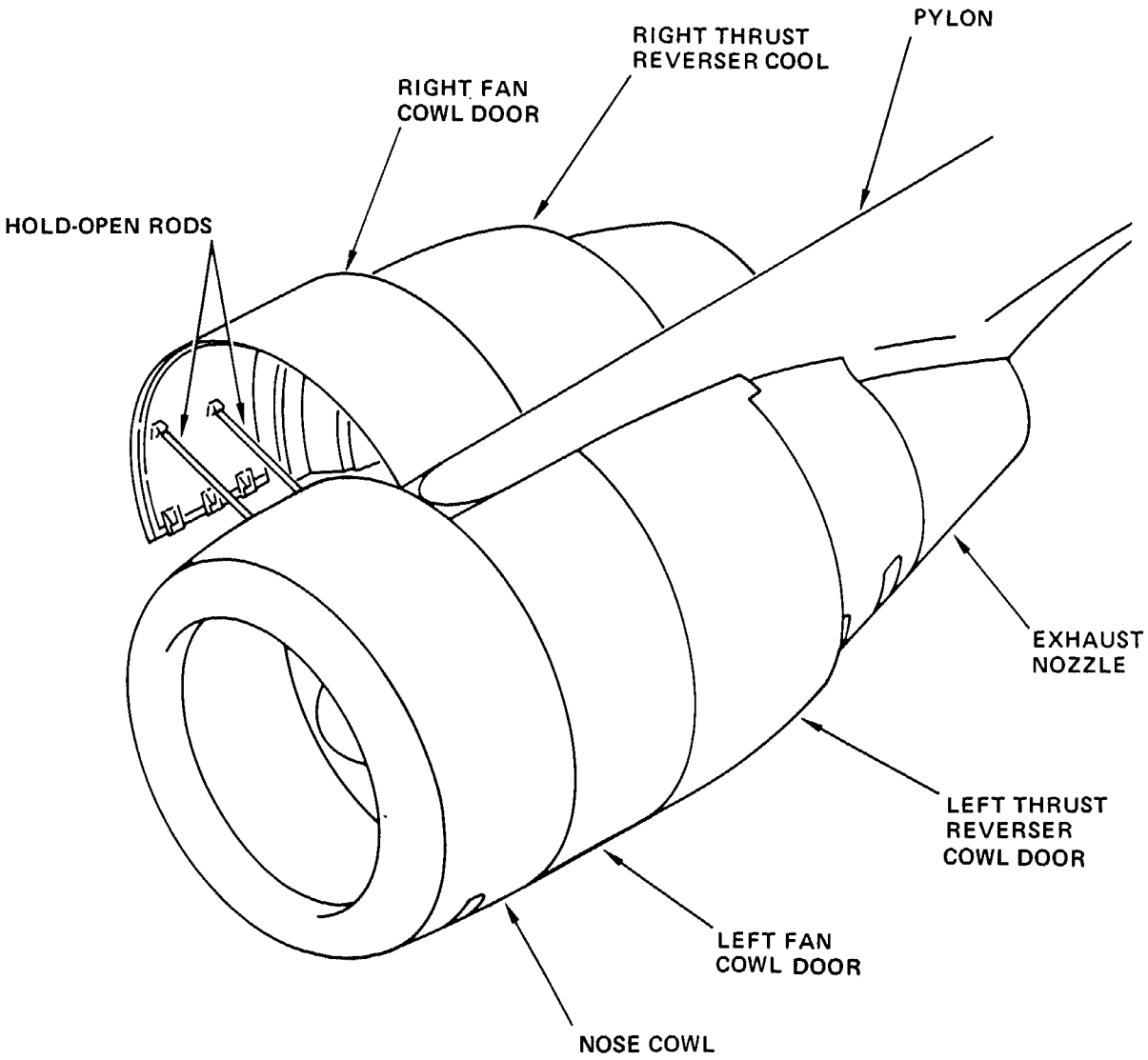
COWLING - GENERAL - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
The following nacelle cowling provides an aerodynamically smooth protective surface over each engine, engine mounted components and accessories.
- Nose cowl.
- Fan cowl.
- Thrust reverser cowl.
- Exhaust nozzle.

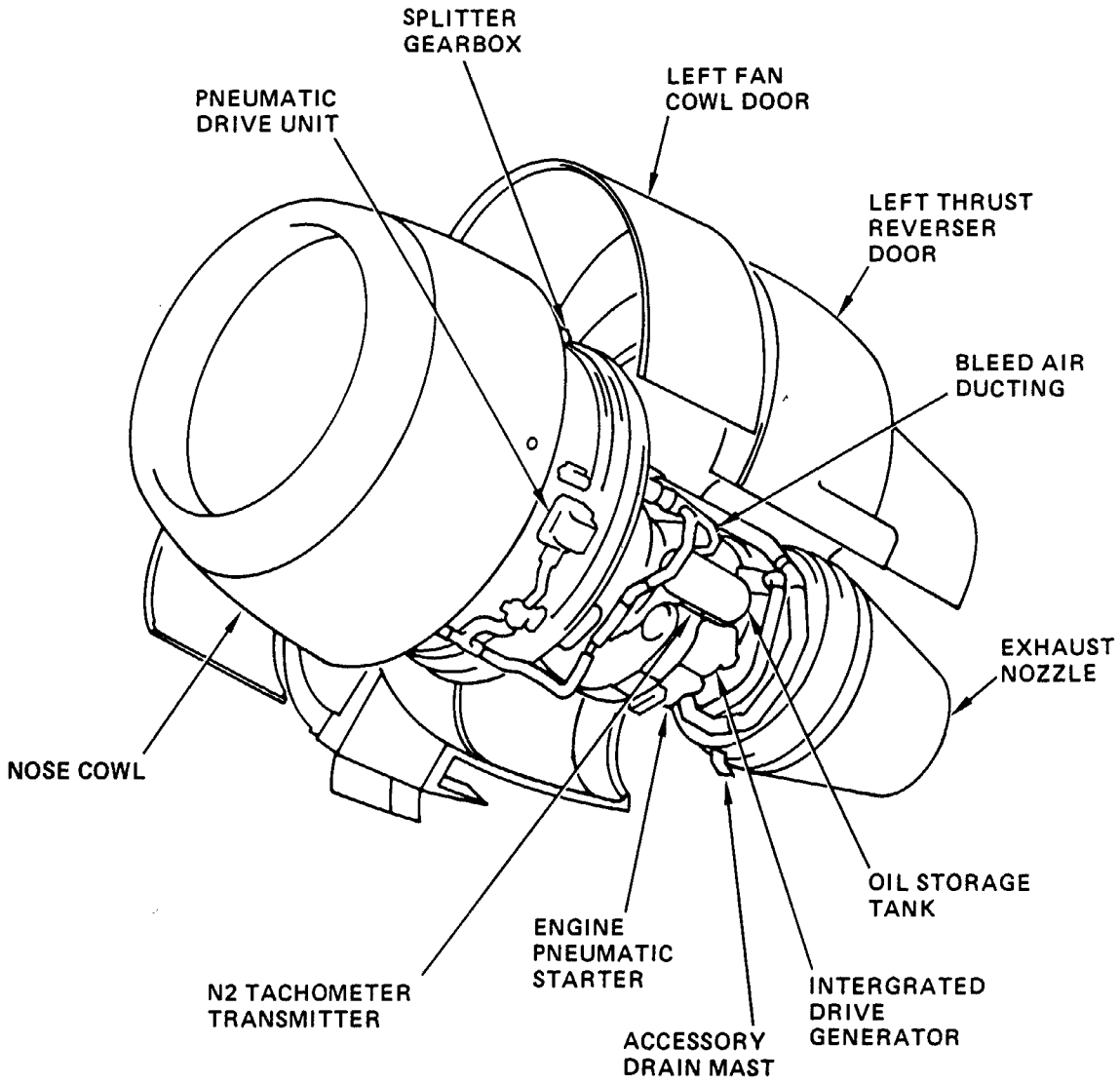
A. Nacelle System General Arrangement.
- Engine built up equipment (Ref. Fig. 002, 003)
- The fan cowl and thrust reverser cowl are hinged from the pylon to provide quick access to the core engine (Ref. Fig. 004)
- The following components, which require frequent inspection or access, may be accessible by an individual door (Ref. Fig. 005)
- IDG for servicing (oil level check, pressure re-oiling, reset)
- Starter for oil filling
- Engine oil tank for filling
- Starter valve override
- Hydraulic filter module
- PT2 - TT2 probe
- Swirl anti-ice nozzle access

B. Composite Applications (Ref. Fig. 006, 007)
- incorporation of composite material is increased for reduced weight
- Nose cowl outer barrel
- Fan cowl
- Reverser outer sleeve
- Cascade entry ramp
- Track fairings

Materials are kevlar/epoxy reinforced by graphite/epoxy. Graphite reinforcement is used for high compression strength and inherent stiffness characteristics.
Structural configurations are of skin stiffeners or honeycomb sandwich.
Acoustic treatment is increased to achieve broadband sound suppression by use of woven steel mesh bonded to aluminium perforated acoustical panel face.
Porous overlay is regarded as non-structural.



Nacelle Cowling
Figure 001



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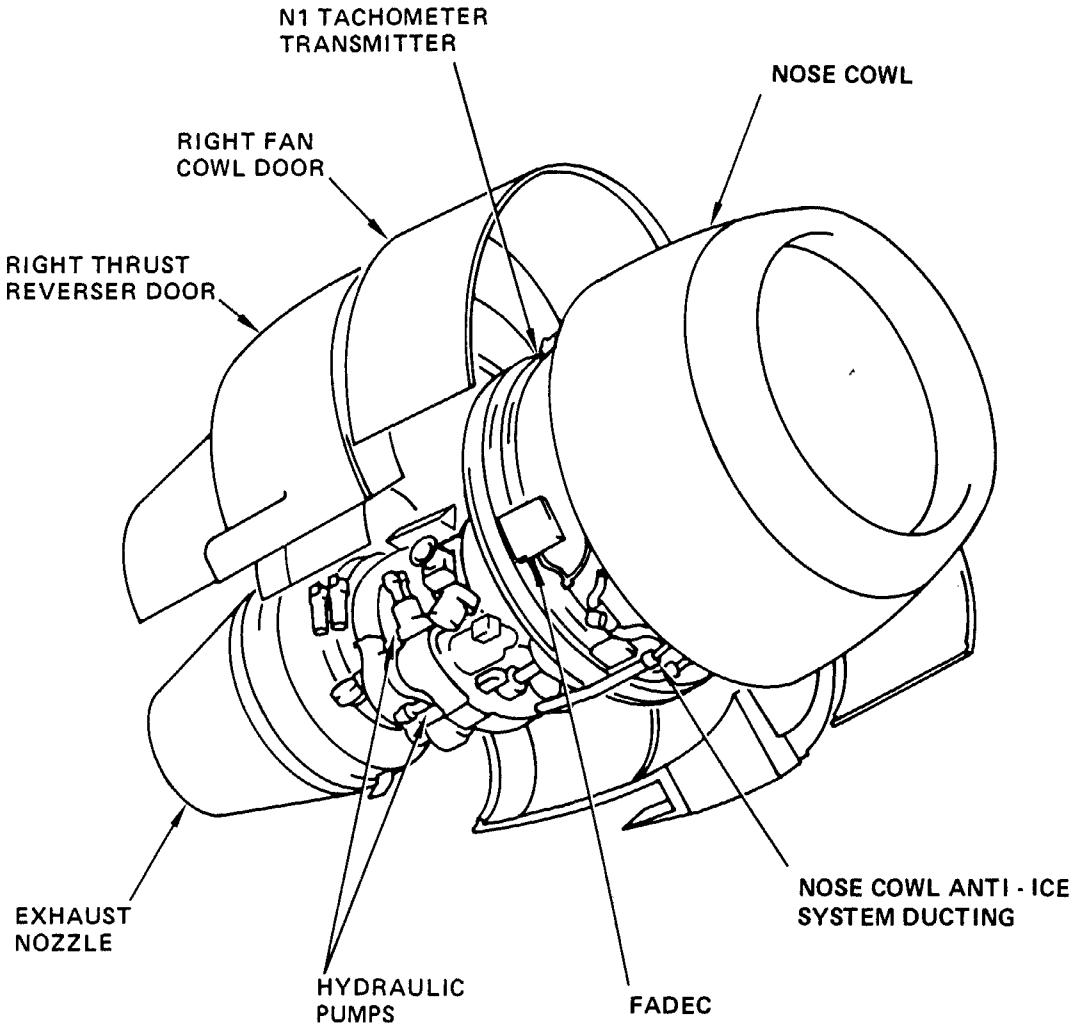
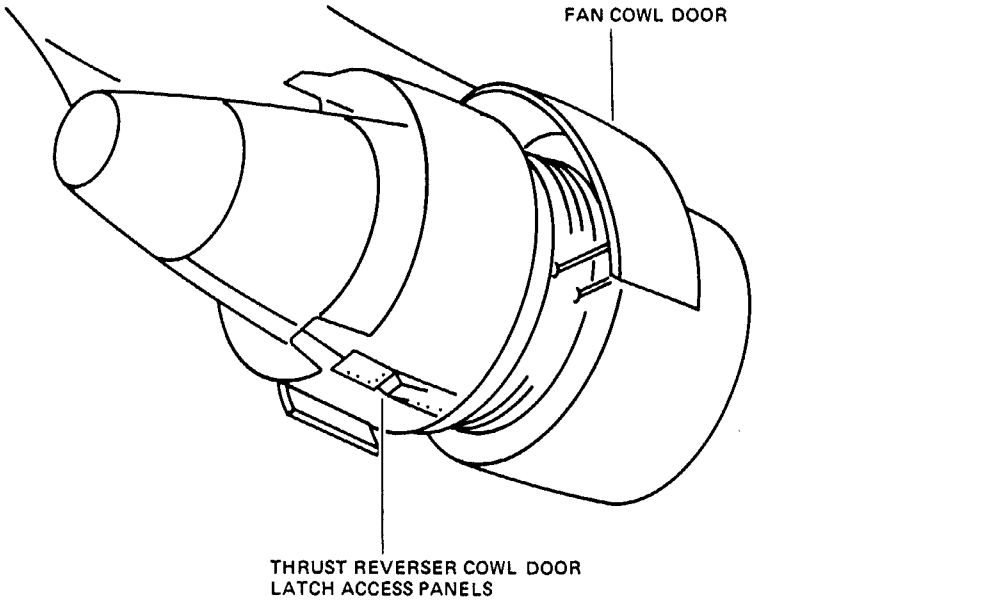
Nacelle - General Arrangement (LH)
Figure 002



Nacelle - General Arrangement (RH)
Figure 003



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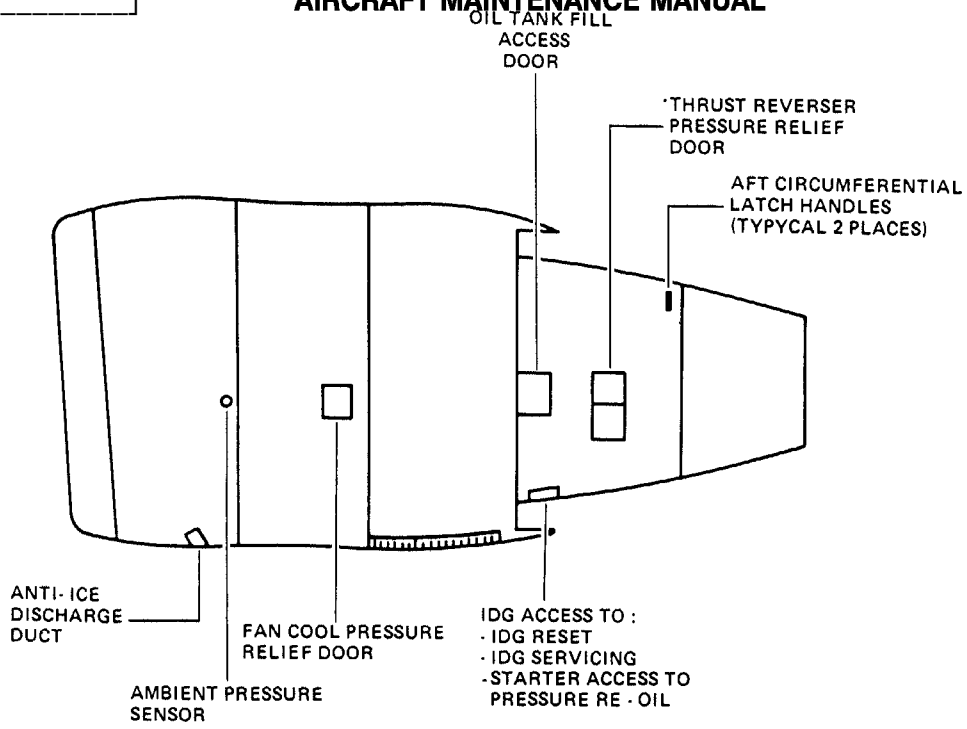
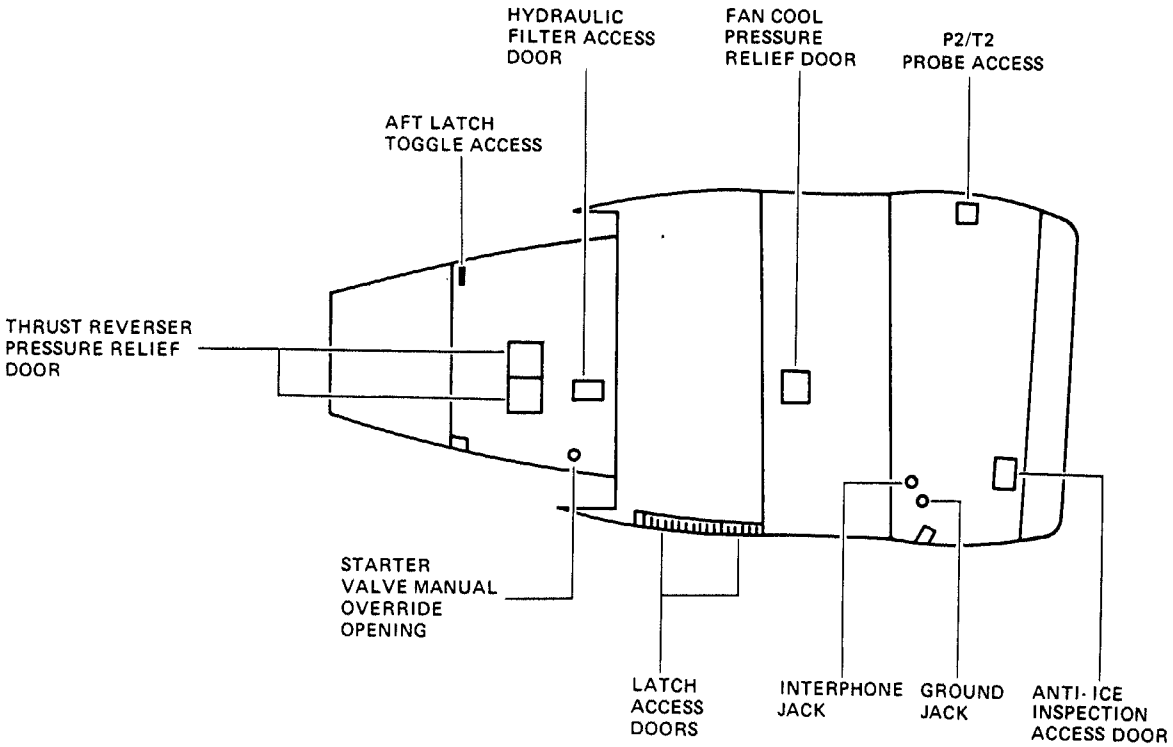
Nacelle - Quick Access to Core Engine
Figure 004


OIL TANK FILL ACCESS DOOR
THRUST REVERSER PRESSURE RELIEF DOOR
AFT CIRCUMFERENTIAL LATCH HANDLES (TYPYCAL 2 PLACES)
ANTI-ICE DISCHARGE DUCT
FAN COOL PRESSURE RELIEF DOOR
IDG ACCESS TO :
- IDG RESET
- IDG SERVICING
-STARTER ACCESS TO PRESSURE RE - OIL
AMBIENT PRESSURE SENSOR



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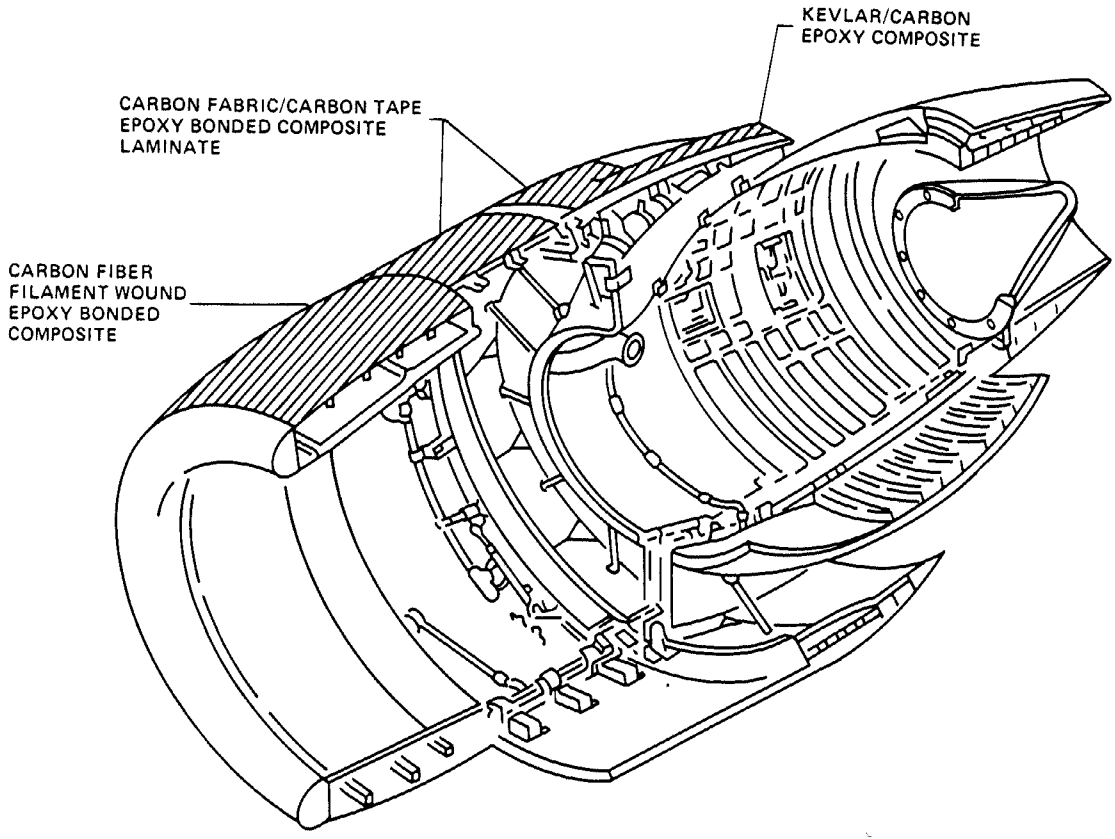
Nacelle Access Doors and Openings
Figure 005



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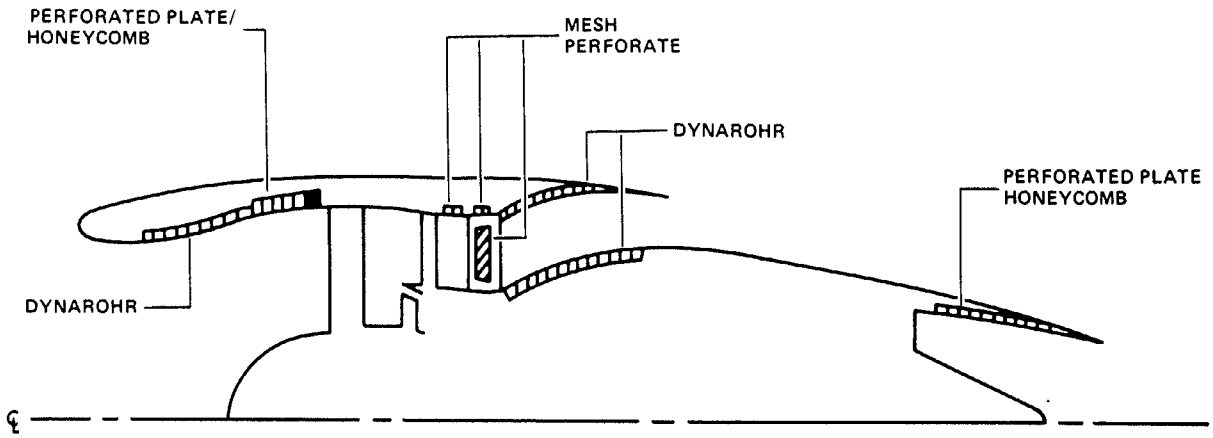
Composite Material Location
Figure 006



NACELLE		PW4000 AREA SQ. FT.
	INLET	69
	AFT DUCT	108
	PRIMARY	28
ENGINE		
	FAN CASE	22,5
		227.5

BM5 71 10 00 0 KNMO 20

Acoustically Treated Area Location
Figure 007

NOSE COWL - DESCRIPTION AND OPERATION

1. Function
The function of the nose cowl is to duct air flow to the fan and core sections of the Engine.

2. Description (Ref. Fig. 001)
The nose cowl structure is an interchangeable aerodynamic fairing assembly and is bolted to the forward face of the engine fan case. The nose cowl assembly is comprised of inner sandwich panels and outer skins supported by non-circular frames. The frames maintain the shape of the inlet and offer internal resisting forces to the aerodynamic loadings. The nose cowl assembly has acoustic panels and provides for installation of anti-icing ducting, one P2T2 probe, and two PS2 sensors, one ground jack, and one phone jack.

A. Dimensions (Ref. Fig. 002)

B. Material (Ref. Fig. 003)

C. Weight : 517 lbs (234kg)

D. Fitting on the engine case is made by 60 bolts(Ref. Fig. 001)

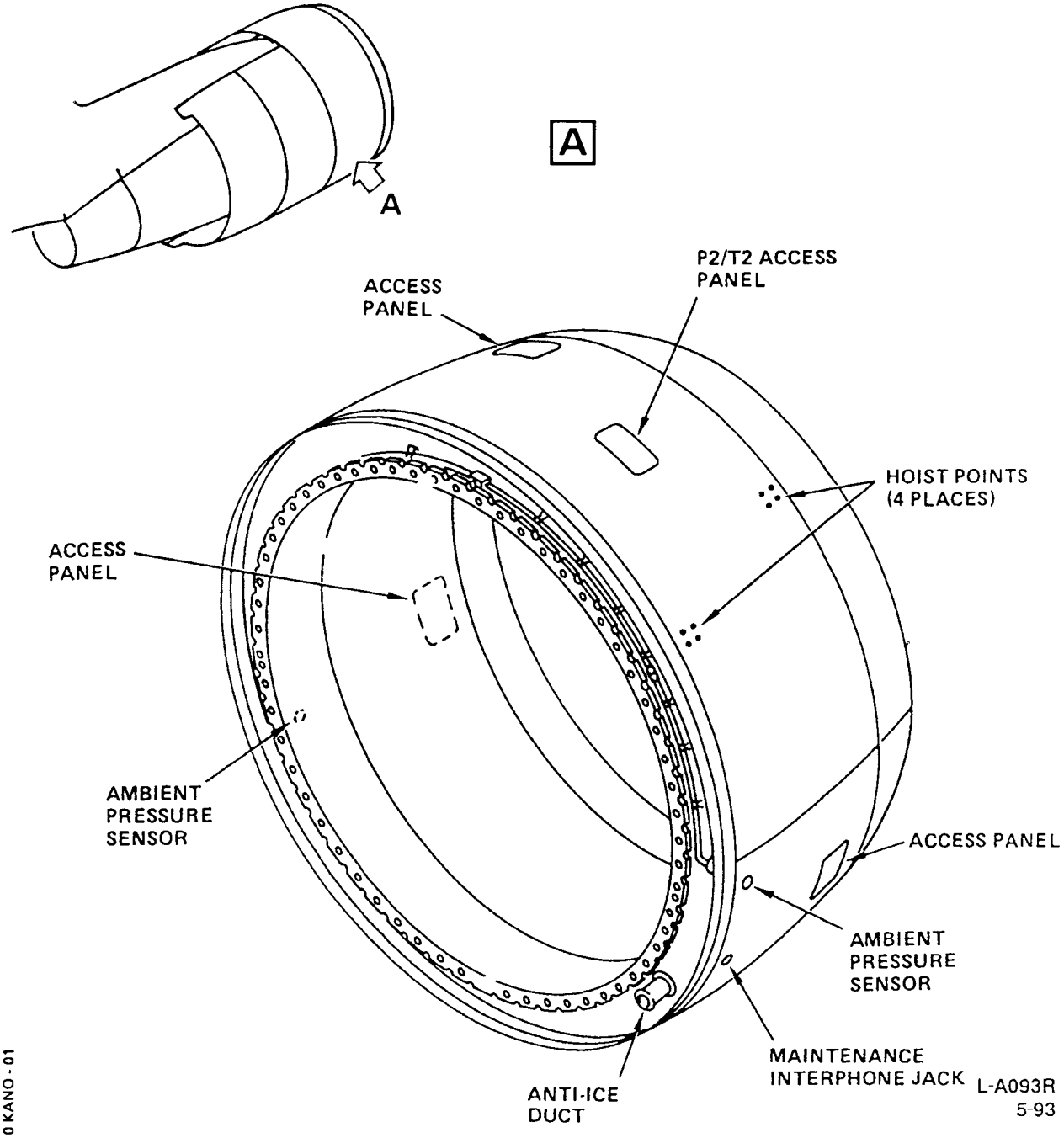
3. Geometry
The centerline of the nose cowl is concentric with the engine centerline at the forward fan case flange, and gradually curves downward to the highlite plane. The theoretical stagnation line is a 92.8 in. diameter. The distance between the leading edge and the forward fan case flange (Nac. Sta. 61.75) is 61.21 in.. The foregoing is for reference information only ; actual dimensions are controlled by lofted shape. The nose cowl assembly forms a slip joint with the fan cowl and Nac. Sta 59.305 and is bolted to the engine fan case forward flange at Nac. Sta. 61.75.

4. Build Up Equipment

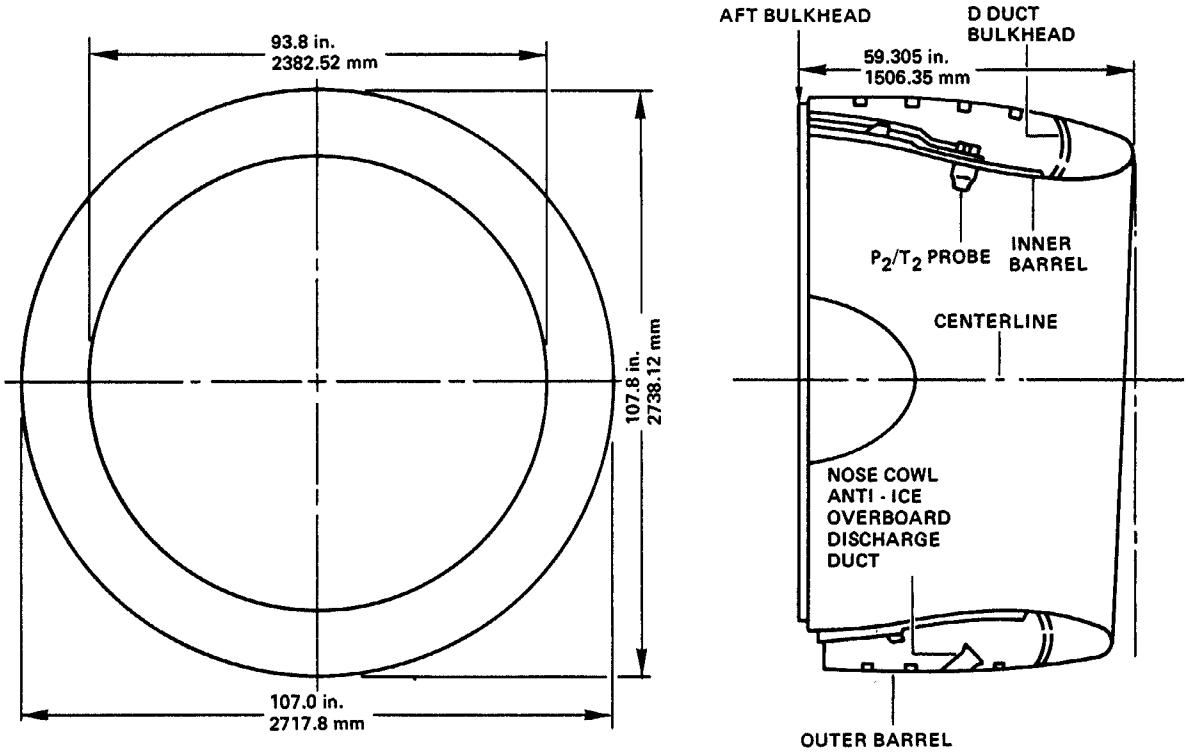
A. PT2/TT2 sensor is installed in the air inlet at about 1 O'clock view looking forward and is electrically anti-iced (Ref. 73-23-00, P. Block 1)

B. The nose cowl is provided with an independently controlled anti-ice system for prevention of ice formation on the nacelle leading edge. The system uses engine bleed air from the 15th stage compressor section. The system includes a shutoff and regulating valve, an anti-ice visual overpressure indicator, a pressure switch , a nose cowl swirl anti-ice nozzle, and associated anti-ice pneumatic ducting and tubing. (Ref. Fig. 001)

C. The nose cowl has one access panel located in the outer skin which is used for access to anti-ice ducting , and the PT2 pneumatic tube. An interphone jack, ground jack and four hoist points are located on the outer surface of the nose cowl.

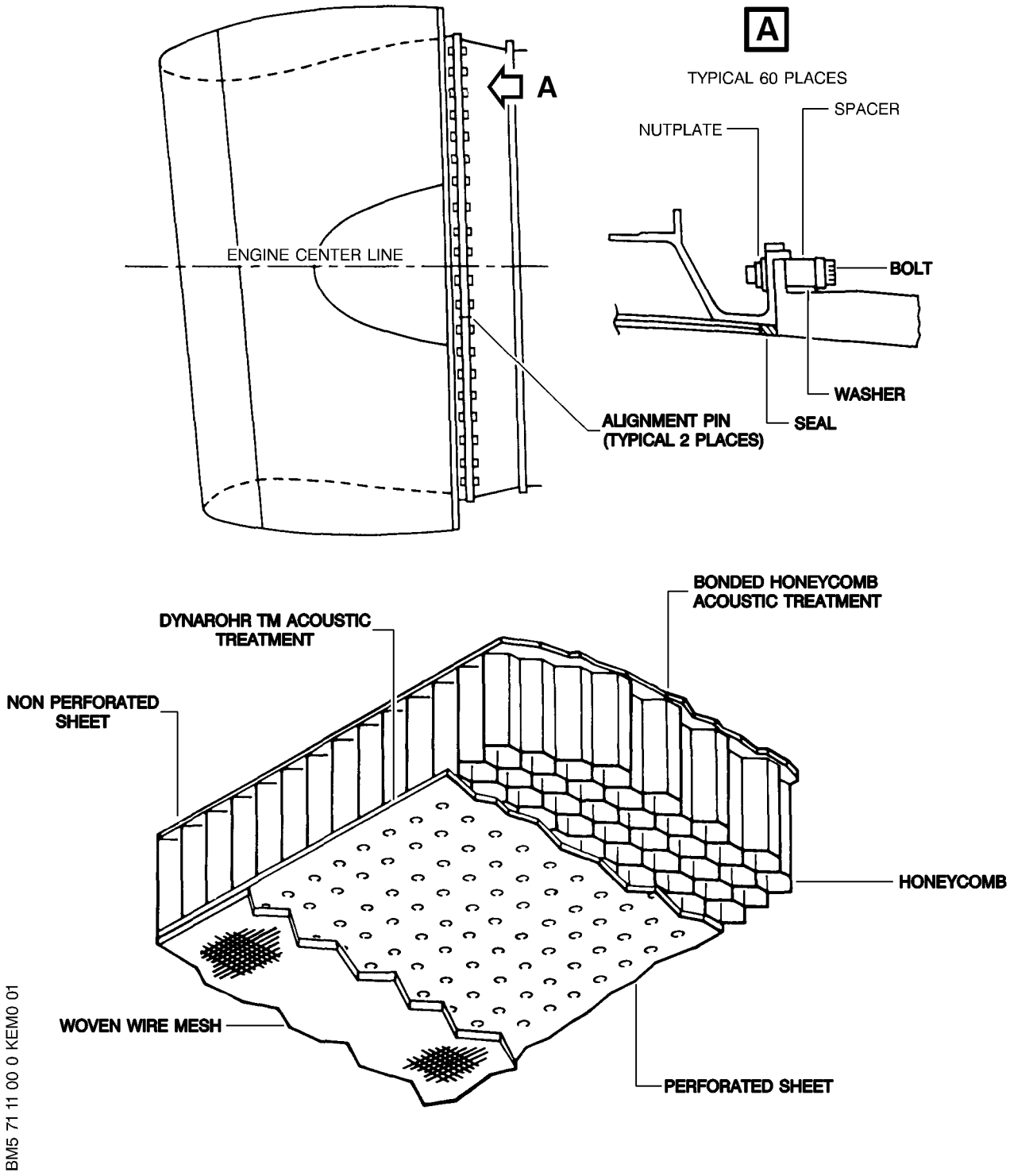


Nose Cowl
Figure 001



BM5 71 11 00 0 KCMO - 19

Nose Cowl - Dimensions
Figure 002



Nose Cowl - Composite Construction and Typical Mounting Bolt
Figure 003

D. Maintenance Interphone Jack
The interphone jack outlet is located at 4 O'clock on the right side in the aft area of the nose cowl.

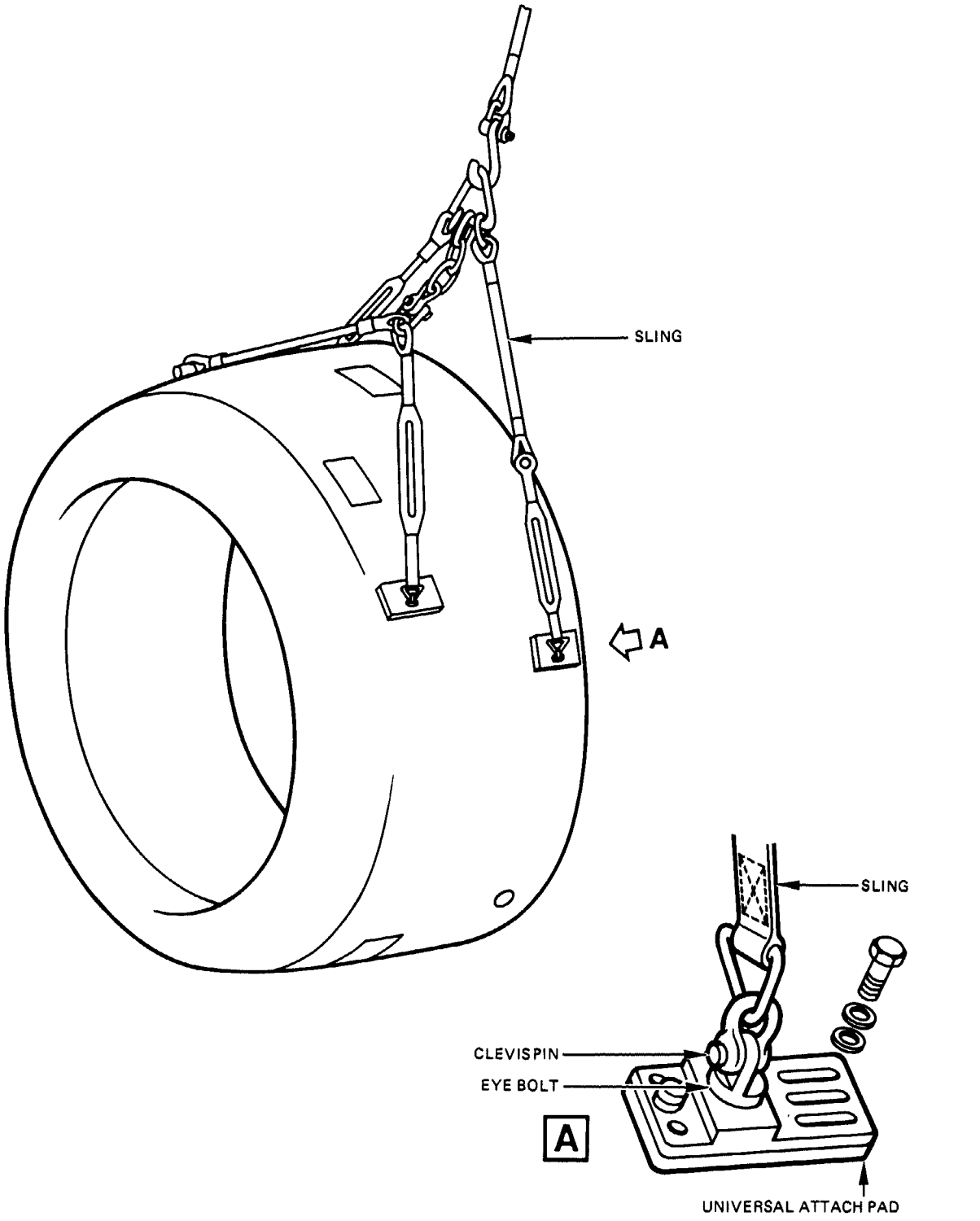
5. Handling and Installation (Ref. Fig. 004)
Four hoist points for ground support equipment are provided on the top portion of the nose cowl. The nose cowl has adequate structural capability, due to frame spacing, to support its own weight and can be supported from below by webbing or a cradle-type support.

6. Nose Cowl Containment Belt (Ref. Fig. 005)

A. Purpose
(1)Secondary containment in the event of fan blade failure.

B. Location
(1)Wrapped around nose cowl fireshield area for 360 degrees just forward of "A" flange.

C. Description and Operation
(1)Composite construction (KEVLAR) with ends secured together by 6 turnbuckles.
(2)Belt is retained axially by brackets and stops.



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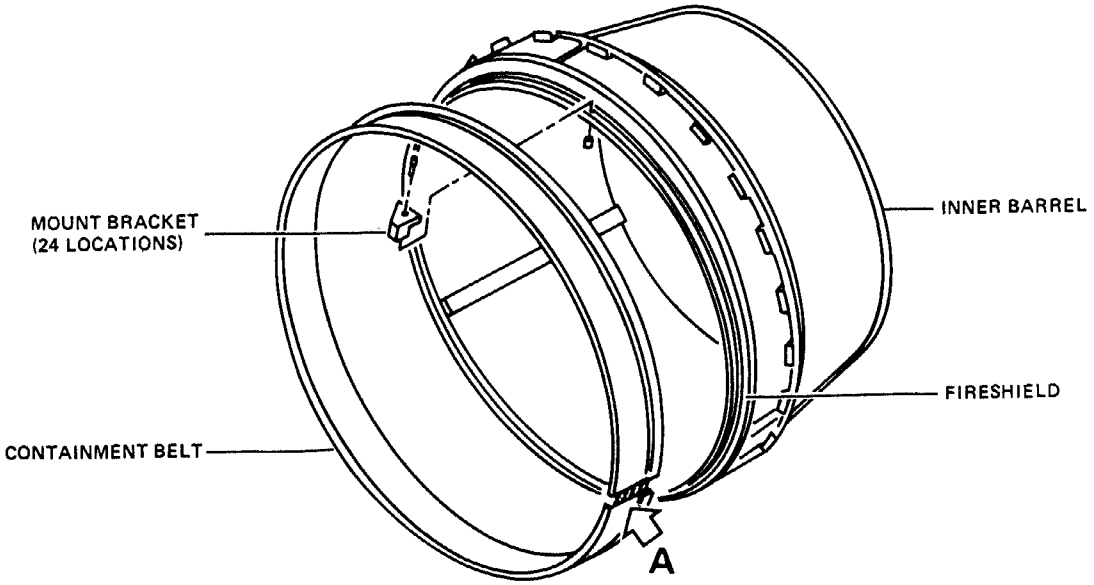
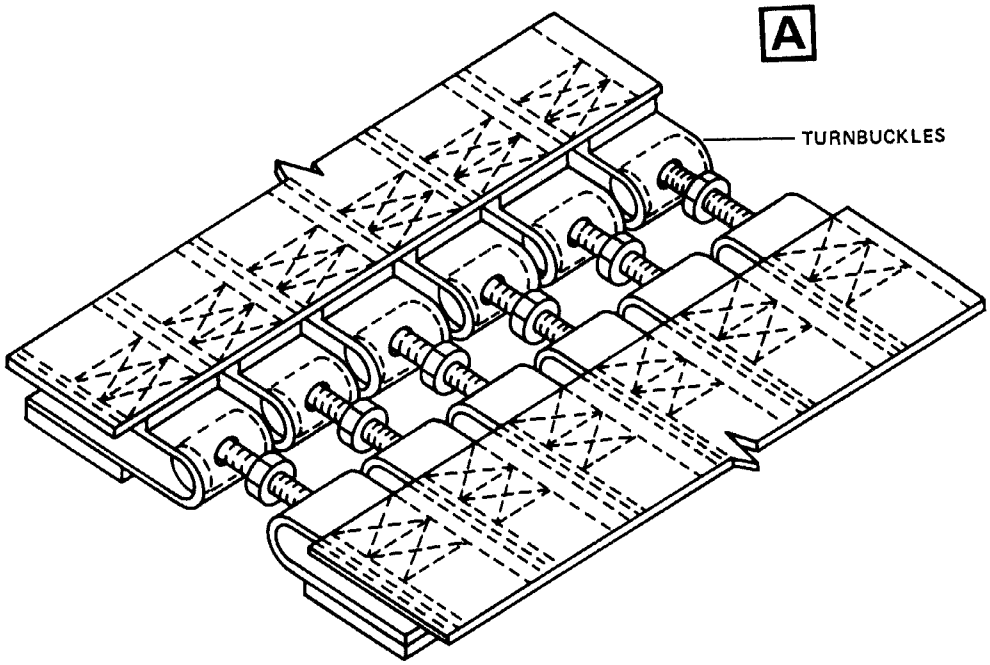
Nose Cowl - Hoisting Points
Figure 004





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Nose Cowl - Containment Belt
Figure 005

NOSE COWL - REMOVAL/INSTALLATION

1. General

A. Removal and installation of the nose cowl requires opening the fan cowl doors (Ref. 71-13-00, P. Block 301).

2. Equipment and Materials

ITEM	DESIGNATION
A. RSE1003	Sling - Nose Cowl
B. RSE1007	Dolly - Nose Cowl
C. RSE1016	Cover - Nose Cowl
D. Material No.P03-001	Oils (Ref. 70-00-00)
E. Material No.P06-013	Lubricants (Ref. 70-00-00)
F.	Protective Caps and Covers
G.	Circuit Breaker Safety Clips
H.	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
R - 71-13-02, P. Block 501	Fan Cowl
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl
- 71-13-05, P. Block 501	Fan Cowl Doors Latch

3. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
22VU	AUDIO SYS-INTPH AMPL-SVCE	20RJ	205/E17
FOR ENGINE 1			
132VU	ANTI ICE-PROBES CAPT ENG1	85DA	325/K67
133VU	ENG1-SCU SUPPLY GND	35KS	333/T76
133VU	ENG1-SCU SUPPLY FLT	37KS	333/T75
FOR ENGINE 2			
132VU	ANTI ICE-PROBES F/O ENG2	86DA	323/M70
133VU	ENG2-SCU SUPPLY GND	34KS	333/T85
133VU	ENG2-SCU SUPPLY FLT	36KS	333/T84

(2)Open the fan cowl doors (Ref. 71-13-00, P. Block 301).

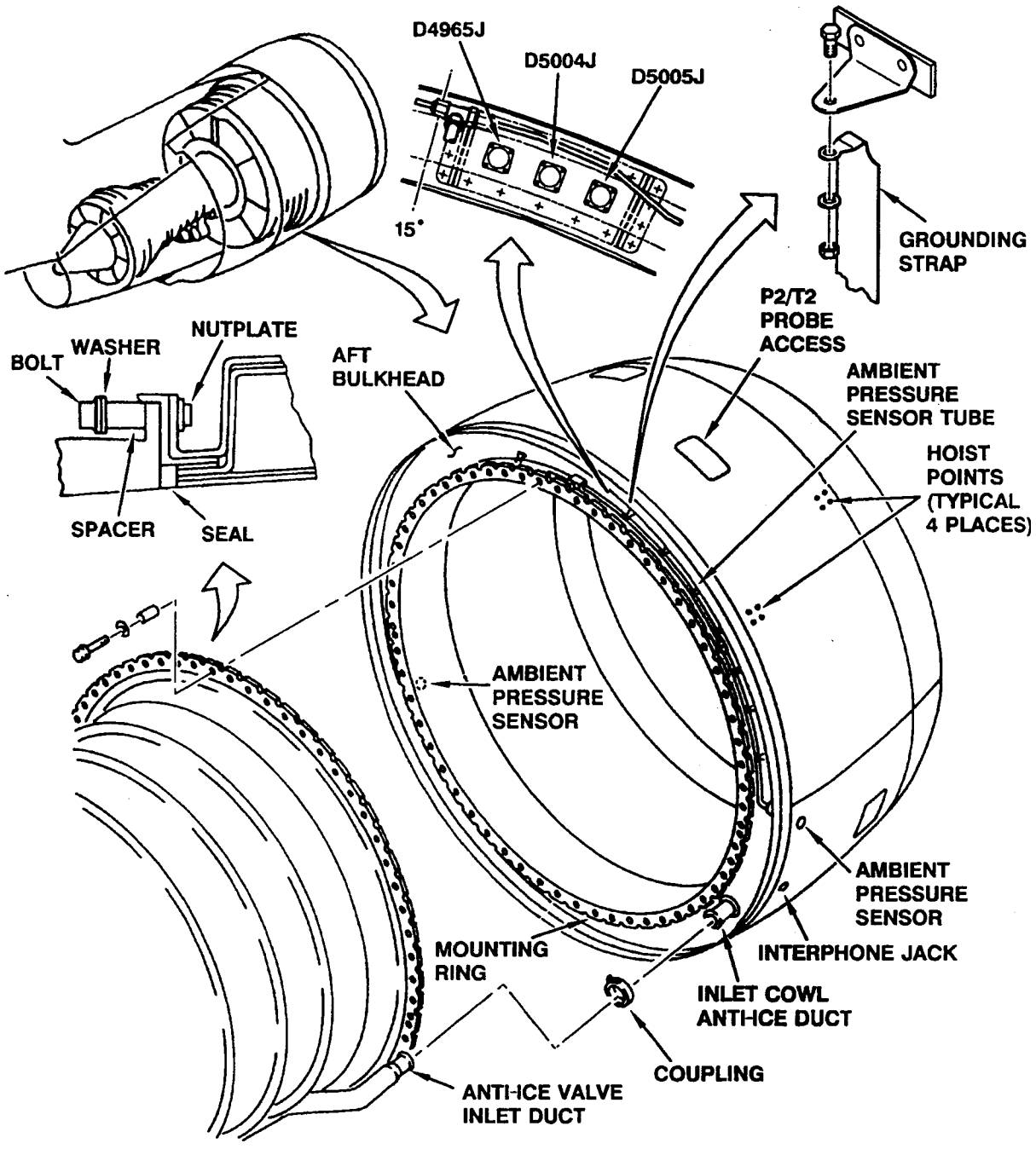
NOTE : Nose cowl upper end surface is covered with pylon cantilever structure and removal/installation of nose cowl can be performed without damage to nose cowl.

B. Removal (Ref. Fig. 401, 402)

(1)Remove bolts, washers and nuts attaching two grounding strips to nose cowl.

(2)Disconnect anti-ice pneumatic duct from nose cowl by removing coupling at aft bulkead. Install protective cover.
(3)Disconnect interphone connector at bottom of aft bulkead. Install protective covers on bulkead fitting and connector.
(4)Disconnect electrical connectors D4965P, D5004P and D5005P from receptacles D4965J, D5004J and D5005J. Install protective covers.
(5)Disconnect PT2 tubing from tee located at top of aft bulkead fitting and install covers and caps on tubing and port fittings.
(6)Remove hoist points filler plugs from top of nose cowl and retain for installation.
(7)Install four sling pads to hoist points.
(8)Position hoist and nose cowl sling over nose cowl and attach sling to pads. Adjust sling to remove slack from sling legs for equal load distribution.
(9)Remove 60 bolts, washers and spacers attaching nose cowl to engine flange, starting at the bottom and proceeding up each side, removing top bolts last.
(10)Support nose cowl weight with hoisting sling and move cowl forward and down away from engine.
(11)Install nose cowl on nose cowl dolly. Disconnect sling pads from hoist points.
(12)Install hoist points filler plugs.

C. Installation (Ref. Fig. 401, 402)
(1)Remove hoist filler plugs from nose cowl. Retain plugs for installation.
(2)Install four sling pads to cowl hoist points and attach nose cowl sling to pads and hoist.
(3)Adjust sling to remove slack from legs and slowly raise cowl from work stand dolly.
(4)Install nose cowl on engine.
(a)Align inlet cowl anti-ice duct with anti-ice valve inlet duct. (Ref. Fig. 401)
(b)Remove the bolts (5), washers (10), and nuts (15) and loosen the support links (20) and (25). (Ref. Fig. 402)
(c)Loosen couplings (30), 2 places.
(d)Position nose cowl on the engine mounting flange alignment pins. (Ref. Fig. 401)
NOTE : The cantilever structure presses on the nose cowl upper end surface.
(e)Remove the protective cover from anti-ice pneumatic duct. Align the nose cowl anti-ice duct on the inlet bulkhead with the anti-ice valve inlet duct.
CAUTION : MAKE SURE THAT THE DUCT MISALIGNMENT DOES NOT EXCEED 0 DEGREES, 30 MINUTES TO THE CENTERLINE OFFSET.
1 If the alignment requirements cannot be met, loosen the coupling (40). (Ref. Fig. 402)
2 Remove the bolt (5), washer (10), and nut (15) and loosen the support link (21).
3 Align the nose cowl anti-ice duct on the inlet bulkhead with the anti-ice valve inlet duct.



BM5 71 11 00 4 KANO 03

Nose Cowl
Figure 401

CAUTION : MAKE SURE THAT THE DUCT MISALIGNMENT DOES NOT EXCEED 0 DEGREES, 30 MINUTES TO THE CENTERLINE OFFSET.

(f) Tighten the support link (20) to the nominal length of 2.62 inches (66.6 mm). Install the bolt (5), washer (10), and nut (15). TORQUE the nut to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).

(g) Tighten the support link (25) to the nominal length of 3.10 inches (78.7 mm). Install the bolt (5), washer (10), and nut (15). TORQUE the nut to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).

(h) Tighten the couplings (30) fingertight.

(i) If applicable, tighten the support link (21) to the nominal length of 2.62 inches (66.6 mm). Install the bolt (5), washer (10), and nut (15). TORQUE the nut to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).

(j) If applicable, tighten the coupling (40) fingertight.

(k) Lubricate threads of 60 bolts with Material No.P03-001. Install 60 bolts, washers and spacers with washers installed under boltheads. Do not final torque bolts at this time.

(l) Final TORQUE a minimum number of bolts (3 or 4) at left and right horizontal centerlines only, to between 310 and 330 lbf. in. (3.50 and 3.72 m. daN).

(m) Remove tension from sling straps.

(n) Final TORQUE remainder of bolts to between 310 and 330 lbf. in. (3.50 and 3.72 m. daN).

(5) Remove sling from nose cowl and position hoist and sling clear of cowl.

(6) Disconnect four sling pads from hoist points.

(7) Install hoist points filler plugs.

(8) Remove protective covers and caps from PT2 tubing and tee located at top of aft bulkhead. Connect tubing to tee and TORQUE to between 145 and 150 lbf. in. (1.64 and 1.70 m. daN).

(9) Remove protective covers from electrical connectors D4965P, D5004P and D5005P. Remove protective covers from receptacles D4965J, D5004J and D5005J. Connect connectors to receptacles at top of aft bulkhead. Tighten fingertight plus one-eighth turn.

(10) Remove protection covers from interphone connector and bulkhead fitting. Connect interphone cable to aft bulkhead fitting.

(11) Torque couplings (30) and (40), if applicable, to value indicated on band. Tap outer perimeters of couplings with plastic mallet while tightening to ensure concentricity.

(12) Apply Material No.P06-013, to inside surfaces of coupling and attach anti-ice duct to elbow in bulkhead with coupling. Torque coupling to value indicated on band.

NOTE : Gap shall not exceed 0.06 in. (1.53 mm) before coupling installation.

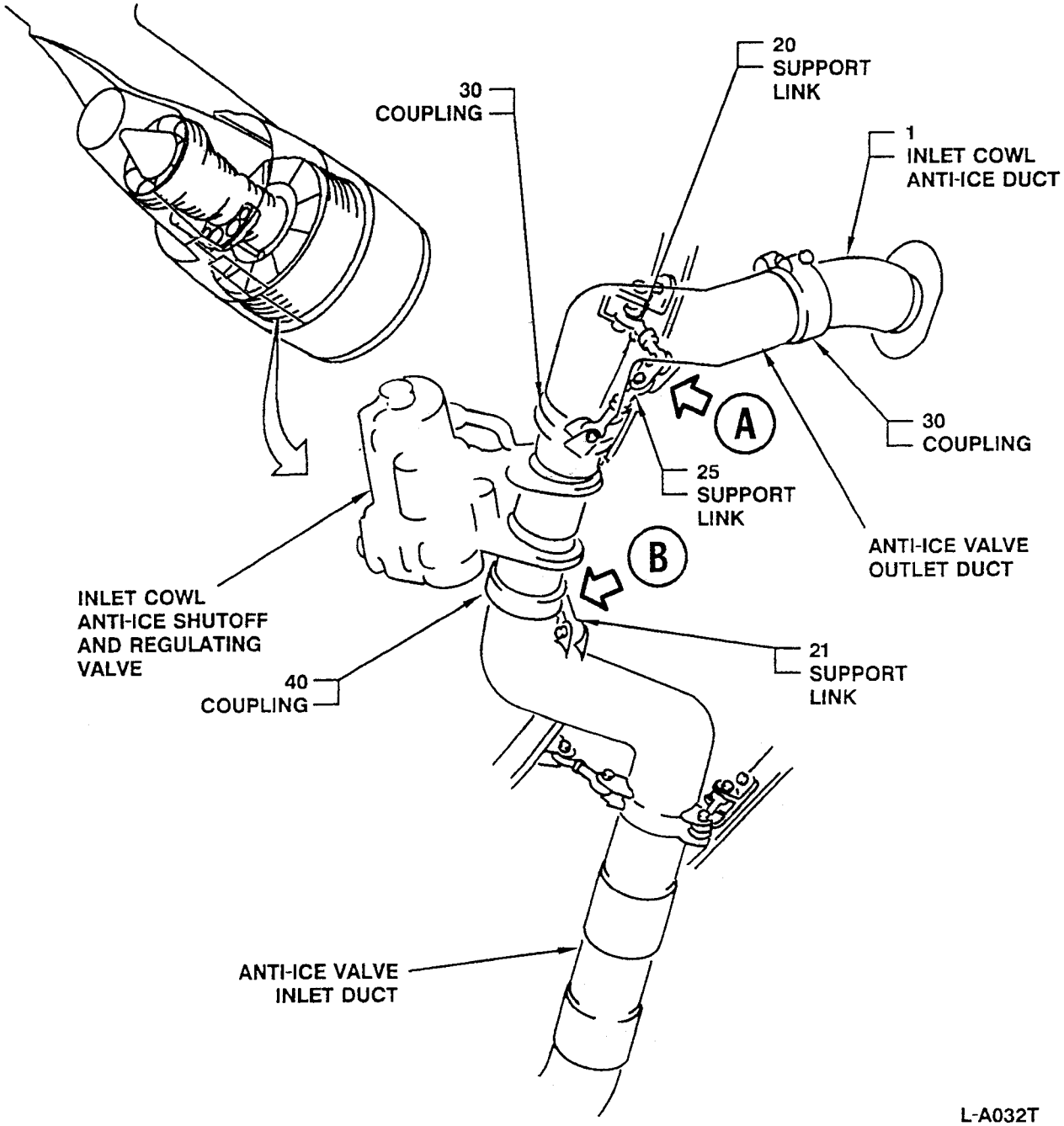
R (13) Install the two grounding strips attached to pylon junction box
R using bolts, washers and nuts. TORQUE nuts to between 50 and
R 70 lbf.in. (0.56 and 0.79 m.daN).

R (14) Adjust fan cowl alignment plate (Ref. 71-13-02, P. Block 501).

D. Close-Up

(1) Leak check PT2 system (Ref. 71-00-00, P. Block 501 - Test No. 14 - PT2 System Leak Check).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.
NOTE : Install RSE1016 nose cowl cover if aircraft is not being returned to service.
(4)Remove, safety clips and tags and close circuit breakers 20RJ, 85DA, 86DA, 34KS, 35KS, 36KS, 37KS.
(5)Check the thrust and fan cowl doors latches (Ref. 71-13-03, P. Block 501 and 71-13-05, P. Block 501).



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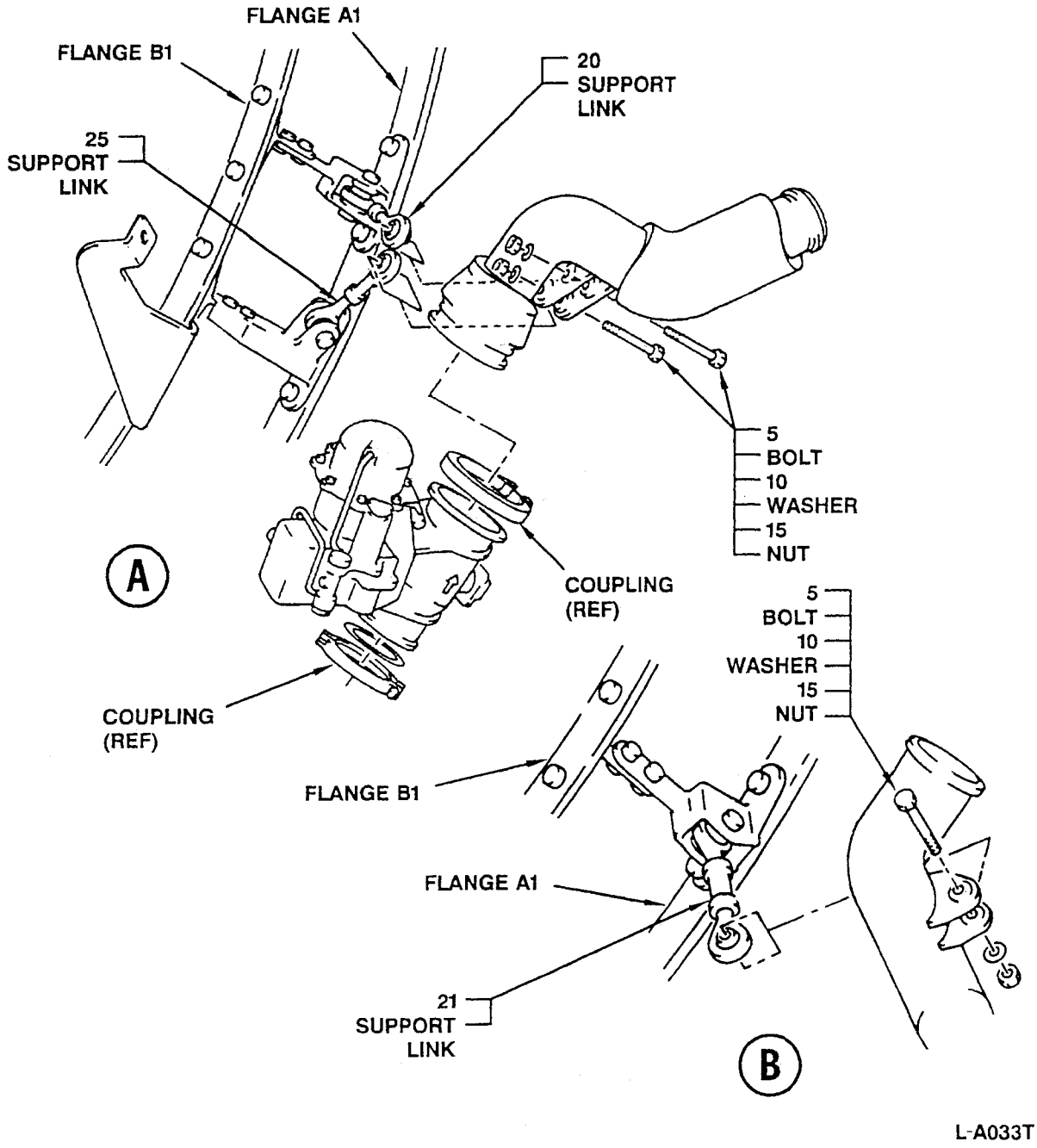
Anti-Ice Duct Alignment (Sheet 1/2)
Figure 402



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Anti-Ice Duct Alignment (Sheet 2/2)
Figure 402

NOSE COWL - INSPECTION/CHECK

1. Damage Limits
For damage limits, refer to 71-00-00, P. Block 601.

2. Visual Check of the Nose Cowl

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Flashlight
Referenced Procedures - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open the fan cowl doors (Ref. 71-13-00, P. Block 301).

C. Visually check the surface and attach points, of the nose cowl (Ref. Fig. 601).

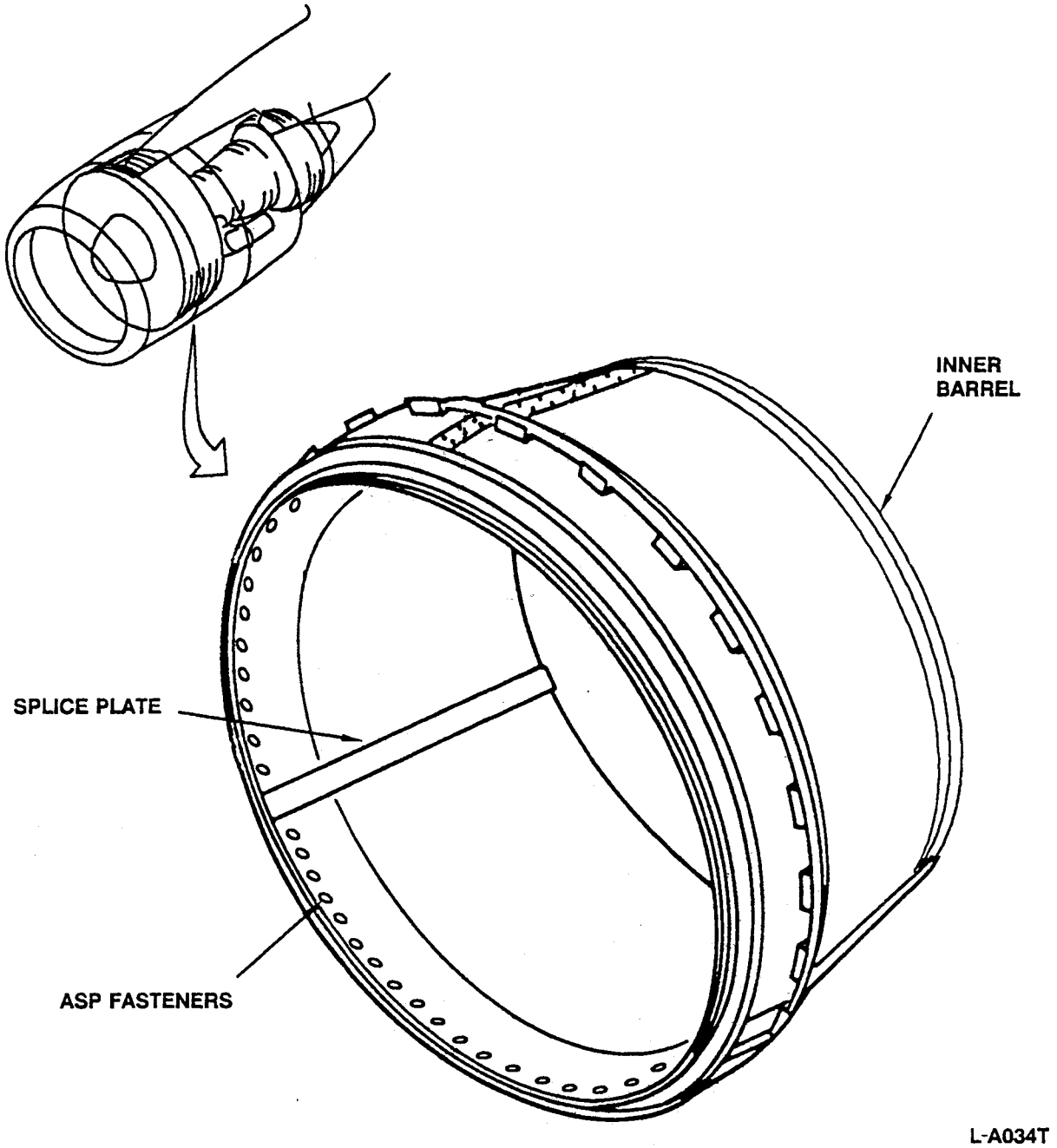
NOMEN-CLATURE	METHOD	INSTRUCTIONS	REQUIREMENTS AND DISPOSITIONS
Screws and Bolts	Visual	Check for corrosion, wear, missing, stripped, or crossed threads.	Replace if defective or missing.
Nuts	Visual	Check for burrs, corrosion or missing.	Replace if defective or missing.
Rivets	Visual	Check for loose or missing.	Replace if loose or missing.
Rubstrip (221-0133)	Visual	Check for torn, loose, worn, damaged or missing sections of rubstrip.	Remove all damaged sections of rubstrip. Clean surface of damaged area. Apply RTV 157 sealant to damaged area until aerodynamically smooth.

NOMEN-CLATURE	METHOD	INSTRUCTIONS	REQUIREMENTS AND DISPOSITIONS
Fastener 2ASPFPDT06-36	Visual	Check for missing fasteners.	There must be at least six fasteners in a continuous sequence adjacent to a missing fastener. There can be no more than four fasteners missing, no two adjacent, per nose cowl. There can be no fasteners missing from splice plates perpendicular to noted fastener pattern. Continue in service until next maintenance opportunity. If criteria is not met, replace missing fasteners.

D. Close-Up
(1)Close the fan cowl doors (Ref. 71-13-00, P. Block 301).

R 3. Inspection of Nose Cowl Mounting Ring and Fasteners for Corrosion

R A. General
R (1)This procedure provides instructions to inspect the aft mount rings
R and fasteners of the nose cowl for corrosion.
R (2)The accomplishment of this procedure requires opening of the fan cowl



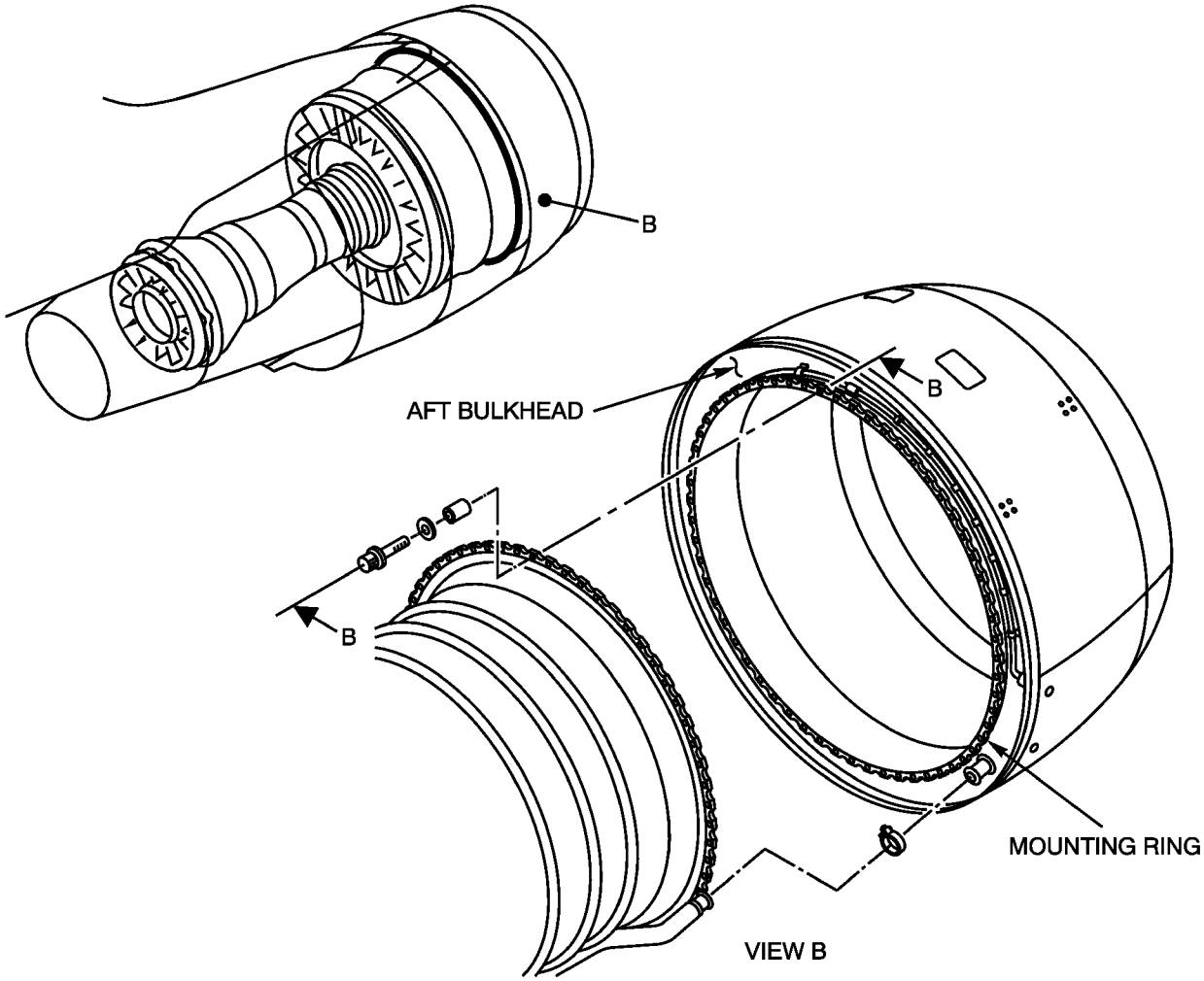
Nose Cowl Inner Barrel, Inspection for
Fasteners Missing
Figure 601

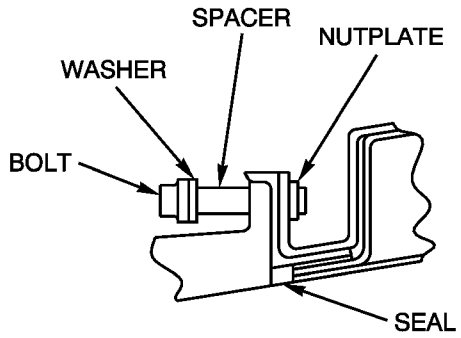
R doors. See 71-13-00, P. Block 301 for opening and closing procedures.

R B. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

R C. Procedure
R (1)Job Set-Up
R (a)Open, safety and tag the appropriate circuit breakers and open applicable fan cowl door (Ref. 71-13-00, P. Block 301).
R (2)Fully examine areas for corrosion (Ref. Fig. 602).
R Refer to SRM to identify corrosion.
R (a)Examine the full surface of the mounting ring at the nose cowl for corrosion.
R (b)Examine the fasteners of the mounting ring for corrosion.
R NOTE : It is not necessary to disassemble the parts for this inspection.
R (3)Remove corrosion if found. Refer to SRM.
R (4)Close-Up
R (a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
R (b)Remove safety clips and tags and close circuit breakers. Close fan cowl doors (Ref. 71-13-00, P. Block 301).





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L-A513R (0509)
PW V

Nose Cowl Mount Ring and Fasteners
Figure 602

R

1. Clean the DynaRohr Wire Mesh Surface on the Inner Barrel of the Inlet Cowl Assembly

CAUTION : DO NOT USE THE FOLLOWING PROCEDURES TO CLEAN POLYURETHANE FILM. THE FOLLOWING PROCEDURES ARE FOR CLEANING DYNAROHR WIRE MESH ONLY.

A. General
This procedure provides cleaning instructions for inlet cowl assemblies with DynaRohr Wire Mesh on the inner barrel.

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-005	Special Materials (Ref. 70-00-00)
(2)Material No.P11-005	Cleaning Agents (Ref. 70-00-00)
(3)Material No.P11-043	Cleaning Agents (Ref. 70-00-00)

C. Procedure
WARNING : SOLVENT IS FLAMMABLE AND VAPOR IS HARMFUL. USE IN A WELL-VENTILATED AREA. AVOID PROLONGED BREATHING OF VAPOR OR PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION OF EYES, NOSE, THROAT, AND SKIN. HIGH CONCENTRATIONS MAY CAUSE IMPAIRED JUDGMENT. PROTECTIVE GLOVES SHOULD BE WORN DURING USE. MAY CAUSE DERMATITIS BY REMOVING SKIN OILS. PRIOR TO USE OF THESE PRODUCTS, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(1)Dampen a Clean Cotton Cloth (Material No.P05-005) with Solvents (Material No.P11-005/Material No.P11-043) (61/39 blend) solution. Do not saturate the cloth with the solution.
CAUTION : DO NOT RUB THE CLOTH BACK AND FORTH ACROSS THE SURFACE AS SOILS WILL BE EMBEDDED IN THE WIRE MESH.

(2)Wipe the contaminated area with the dampened cloth. Immediately wipe with dry cotton cloth after each solvent wipe. Replace the cloth as necessary.
CAUTION : DO NOT DAMAGE THE WIRE MESH WITH A PLASTIC SQUEEGEE.

(a)Spray the contaminated area with Solvents (Material No.P11-005/Material No.P11-043) solution. Allow solution to soak for 15 minutes. Remove larger areas of buildup with a plastic spatula. Repeat Solvents (Material No.P11-005/Material No.P11-043) spray process and wipe area clean with a soft bristle brush.

(b)Flush the area clean with Solvents (Material No.P11-005/Material No.P11-043) solution. Air blow the surface at a 45 degree angle to dry and remove particles trapped in the wire mesh. Do not wipe the surface.

2. Clean the Polyurethane Film Surface on the Inner Barrel of the Nose Cowl Assembly

A. General
(1)This procedure provides cleaning instructions for nose cowl

assemblies with polyurethane film for repair to the inner barrel.

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-005	Special Materials (Ref. 70-00-00)
(2)Material No.P11-052	Cleaning Agents (Ref. 70-00-00)

C. Procedure

CAUTION : INCORRECT METHODS OF CLEANING WILL CAUSE POLYURETHANE FILM TO DISBOND. CLEANING OF POLYURETHANE FILM SURFACES REQUIRES SPECIAL CLEANING SOLUTIONS AND PROCEDURES. DO NOT USE MEK, MIBK, OR ANY SIMILAR SOLVENTS OR DEGREASERS. DO NOT AIR CLEAN USING PRESSURIZED AIR OR VACUUMS. DO NOT USE HOT WATER (TEMPERATURE NOT TO EXCEED 100°F (44°C) OR HIGH PRESSURE WASH METHODS.

(1)If necessary, clean surface area of the polyurethane film using water based cleaners only.
  (a)Spray apply cleaning solution or apply it with a soft dampened cloth (Material No.P05-005).
    Allow solution to soak for three to five minutes.
  (b)Gently rub entire surface with soft cloth.
  (c)Rinse clean with water-soaked cloth until all cleaning solution is removed.

D. Alternate Procedure

WARNING : FOLLOW ALL SAFETY GUIDLINES. AVOID SKIN CONTACT. AVOID BREATHING VAPORS. USE IN WELL-VENTILATED AREA. PRIOR TO USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE MATERIAL SAFETY DATA SHEET AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(1)If necessary, clean surface area of polyurethane film using cleaner (Material No.P11-052).
  (a)Mix one part cleaner (Material No.P11-052) with four parts water.
    Stir cleaning solution until mixed.
  (b)Spray apply cleaning solution or apply it with a soft dampened cloth (Material No.P05-005).
    Allow solution to soak for three to five minutes.
  (c)Gently rub entire surface with soft cloth.
  (d)Rinse clean with water-soaked cloth until all cleaning solution is removed.

COWL DOORS - DESCRIPTION AND OPERATION

1. General

A. There are two pairs of cowl doors : The fan cowl doors and the thrust reverser cowl doors. When latched, they form part of the aerodynamic smooth surface of the complete engine nacelle which is composed of the nose cowl, the fan cowl, the thrust reverser cowl, the exhaust nozzle, and the plug. In addition, the thrust reverser doors provide a formed internal duct which directs engine fan thrust rearward of forward on flight crew command.
(Ref. Fig. 002, 003)
(Ref. Fig. 001)

B. The major purposes of these cowl doors are as follows :
(1)To provide an aerodynamically smooth surface for the engine sections they enclosed.
(2)To reverse the fan thrust on flight crew command.
(3)To reduce engine flexing for all temperatures and aircraft attitudes.
(4)To seal and cool the engine.
(5)To pressurize and cool cabin compartments and provide fan air for the pneumatic system and anti-ice system.
(6)To provide protection against overpressure.
(7)To provide doors and access panels for rapid servicing, inspecting, and maintenance.

2. Fan Cowl Doors (Ref. Fig. 004, 005, 006)
(Ref. Fig. 007, 008)

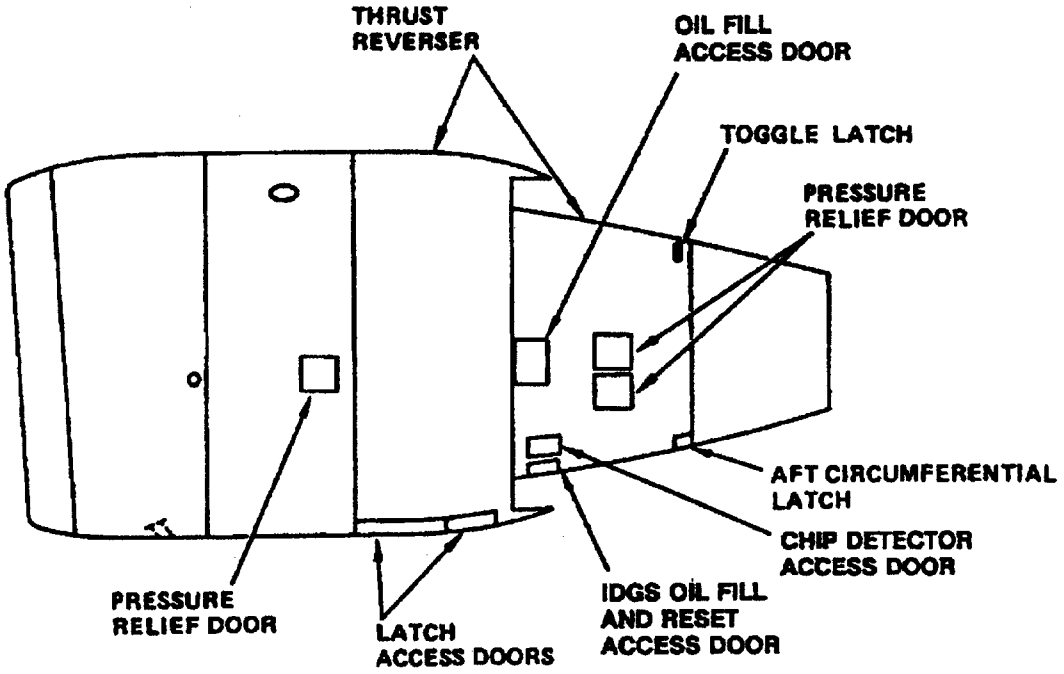
There are two fan cowl doors. They are hinged to the pylon at the top and latched together at the bottom to form the complete fan cowl. Fan cowl doors must be opened before the thrust reverser doors are unlatched and opened. Prior to closing and latching these doors, the thrust reverser doors must be closed and latched. Major parts and functions of the doors are described below.

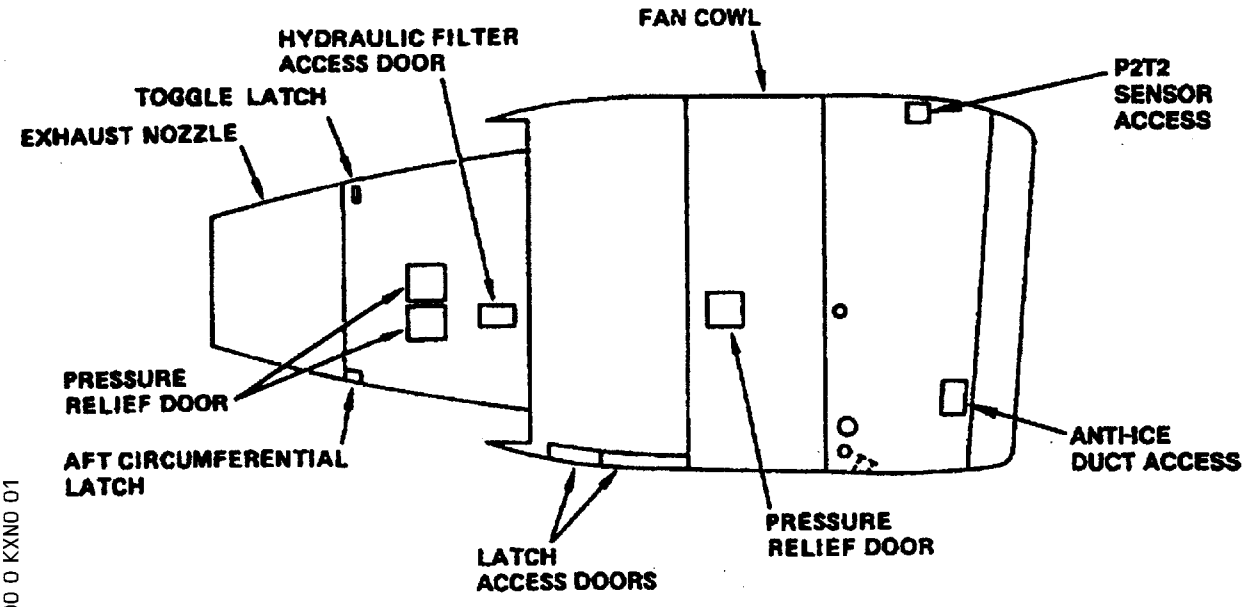
A. Each fan cowl door is a large, curved, rectangular panel, approximately 107 in. (2718 mm) high and 41 in. (1034 mm) wide.

B. Materials
The fan cowl is a sandwich construction with :
- an aluminium honeycomb core
- kevlar/graphite epoxy skin

C. Weight = 125 lbs (56.6 kg).

D. Two hold-open rods are provided for each door. One rod is mounted and stowed on the fan cowl door and one is mounted and stowed on the fan case. When maintenance is performed in the fan case area these two rods are used to lock the door open at two positions, a 40 degree position and a 55 degree position. When not in use, they are locked in the stowed





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Fan Cowl and Thrust Reverser Access Doors
Figure 001

position on brackets.

E. Each door is hinged at the top by three hinges that attach the fan cowl door to the pylon. When closed and latched the door tops are sealed against the pylon.

F. Each door is sealed on all edges. At each side, the door mates evenly into recessed edges of the nose cool and thrust reverser door to form a smooth continuous surface. The top edge of the door seals against the pylon. At the bottom edge, rubber bumper seals on the right door mate with metal seals on the left.

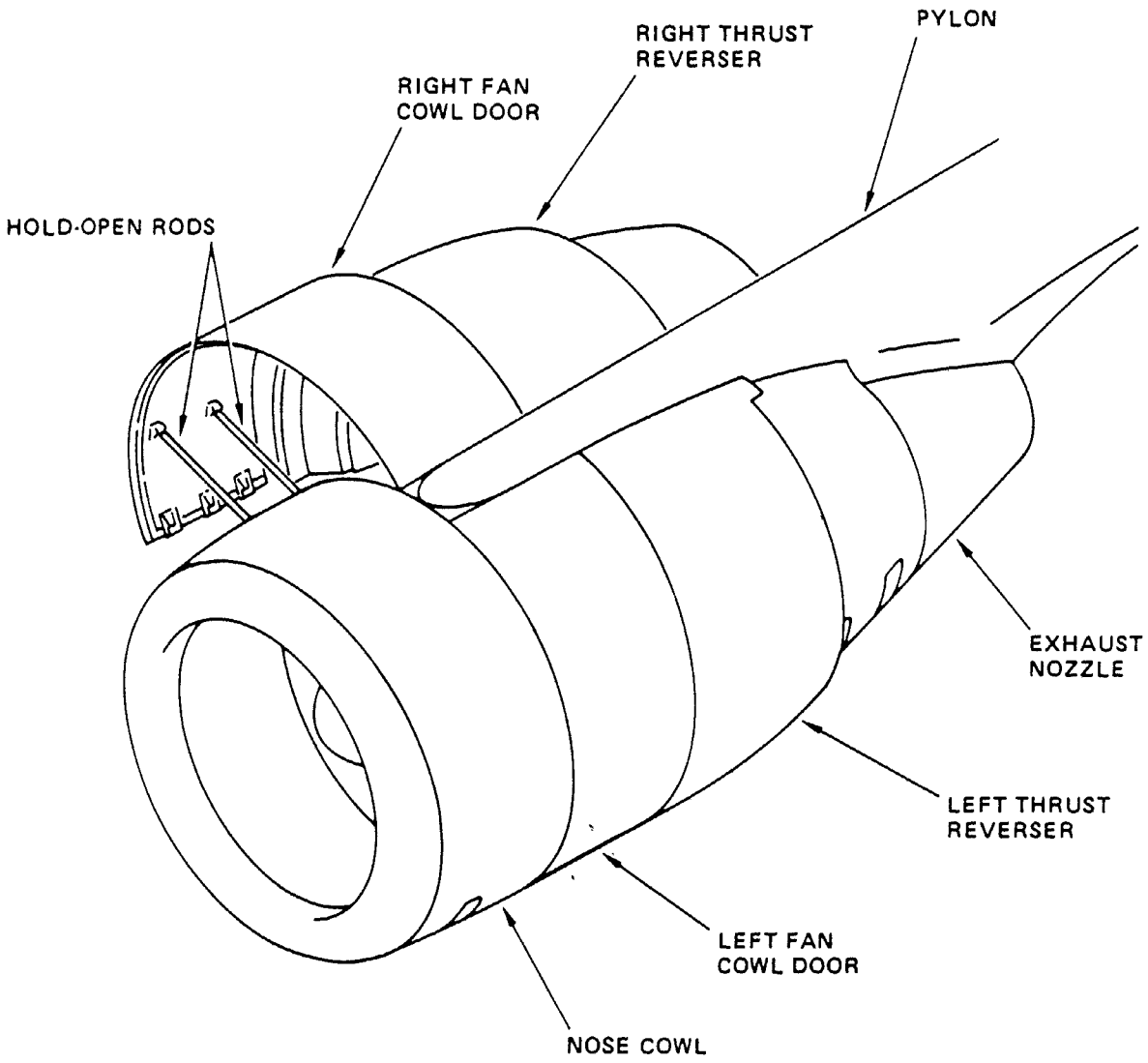
G. The fan cowl doors are latched together at the bottom edges by three latch assemblies. A latch assembly is comprised of one latch handle and hook installed on the right door and one adjustable eyebolt installed on the left.

H. Each door contains three groups of sling hoist points.
These points are used to attach a sling when a fan cowl door is removed or installed if necessary they can open or hold open a fan cowl door. An attached sling must be used when hold-open rods are removed or installed. When these points are not in use, hoist point plugs are installed which fit flush with the nacelle surface and prevent foreign objects from entering and lodging in the hoist point openings.

R J. Each fan cowl door has a pressure relief door installed at the aft, center position. It will open when the internal pressure of the fan cowl compartment is 3.0 psi (0.21 BARS) greater than the external air pressure.

R K. Placards and markings are placed on the exterior and interior of the fan cowl doors to provide cautions, service data and information.

R L. V-groove indicators on each fan cowl door prevent the doors being closed and locked if the thrust reverser V-blades, located on the forward edge of the thrust reverser door, are not completely seated in the V-grooves on the engine fan case.



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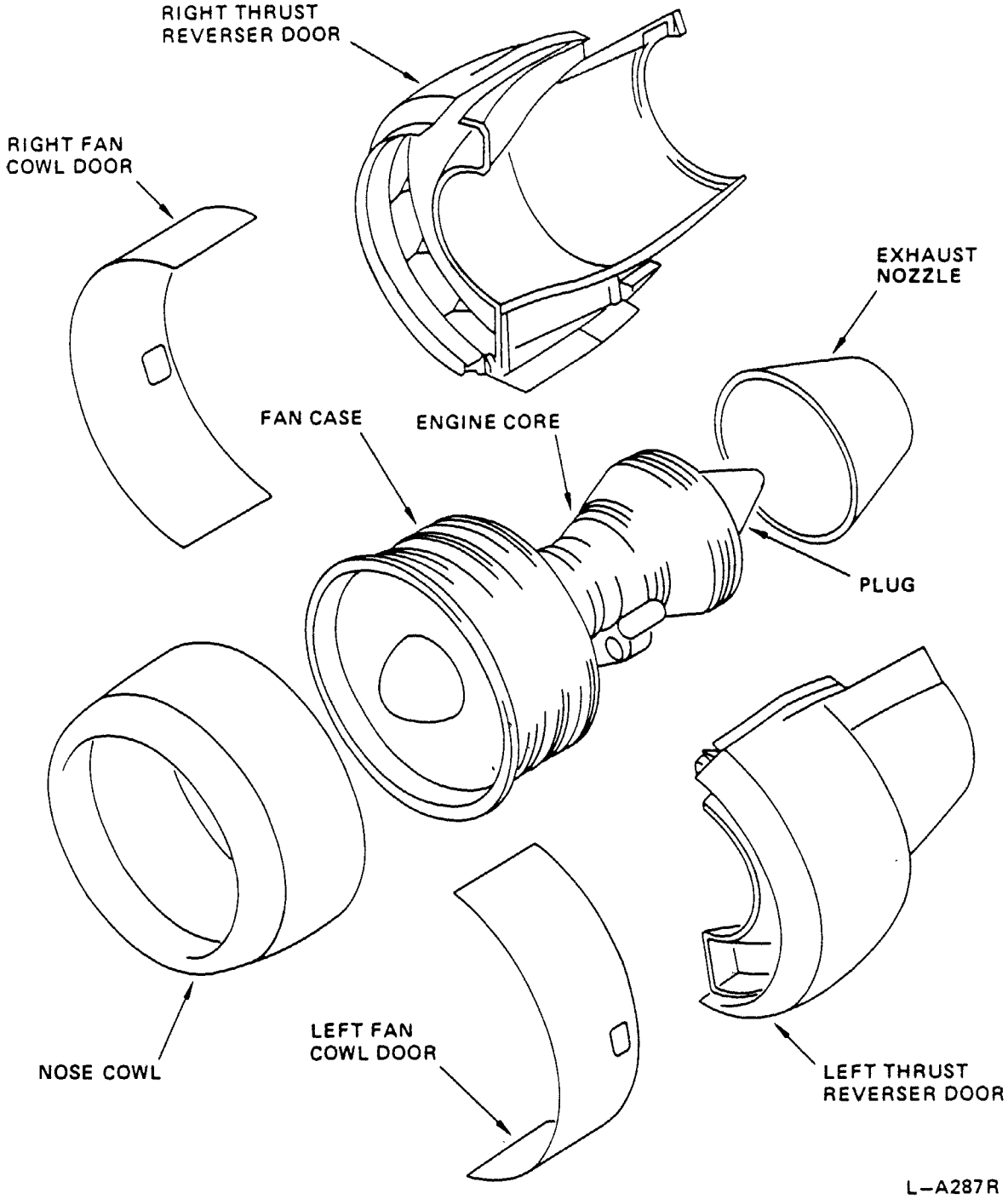
Engine Nacelle
Figure 002



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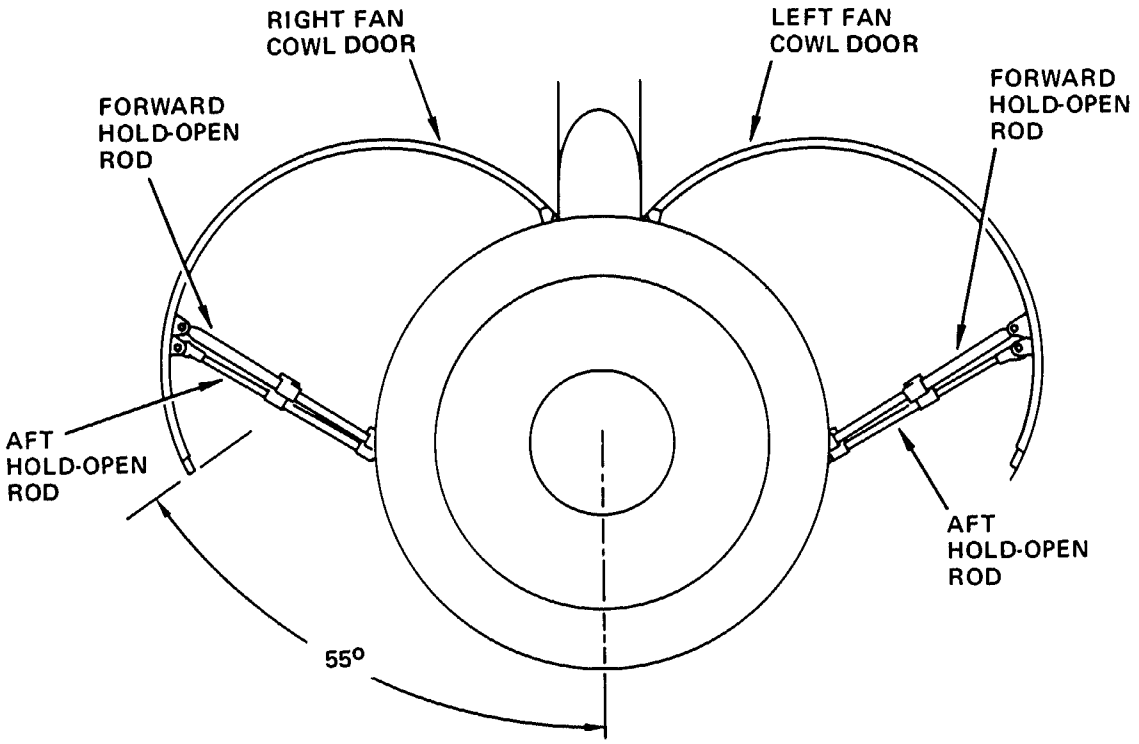
Engine and Engine Nacelle Major Areas
Figure 003



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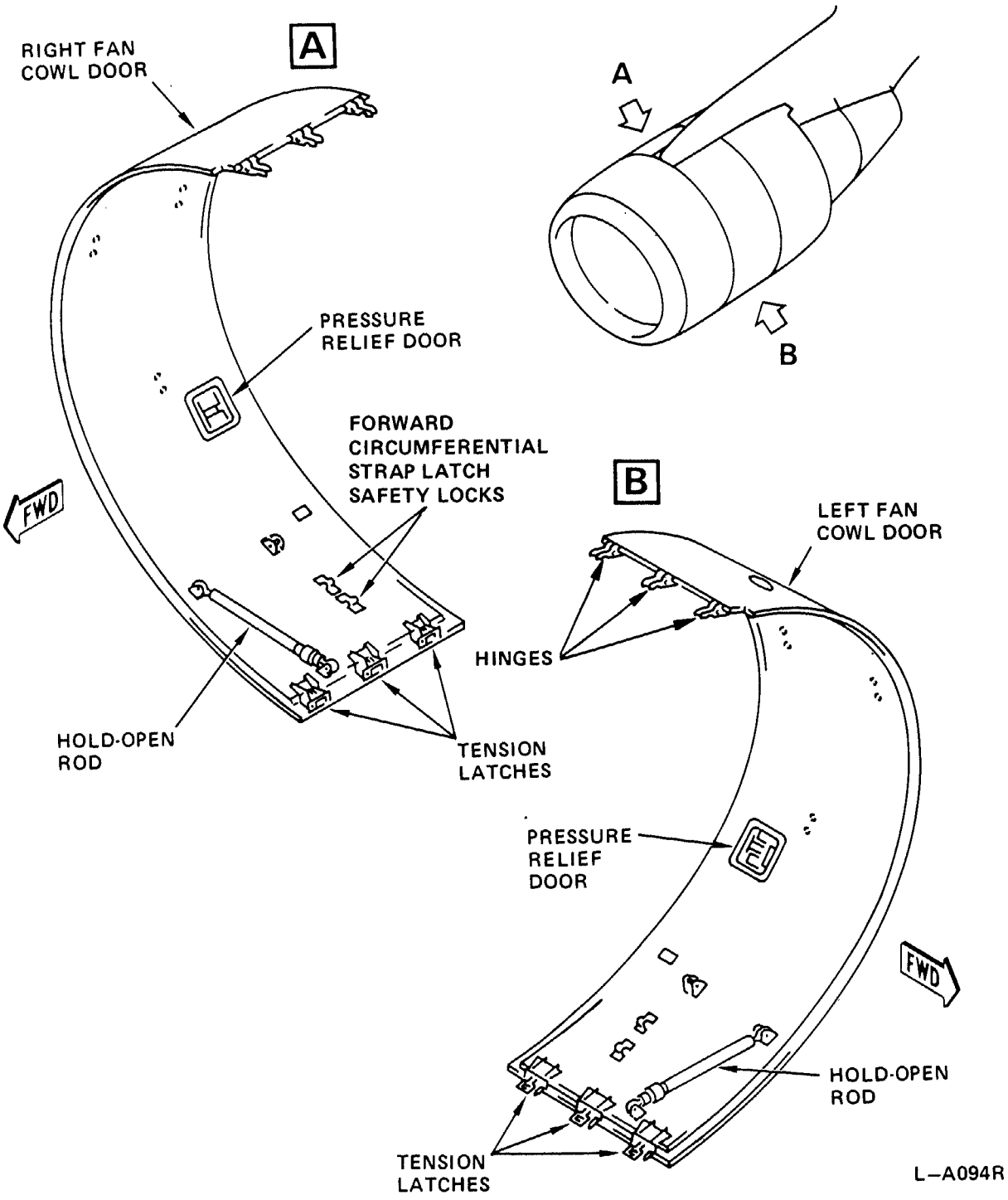
Fan Cowl Open Positions
Figure 004



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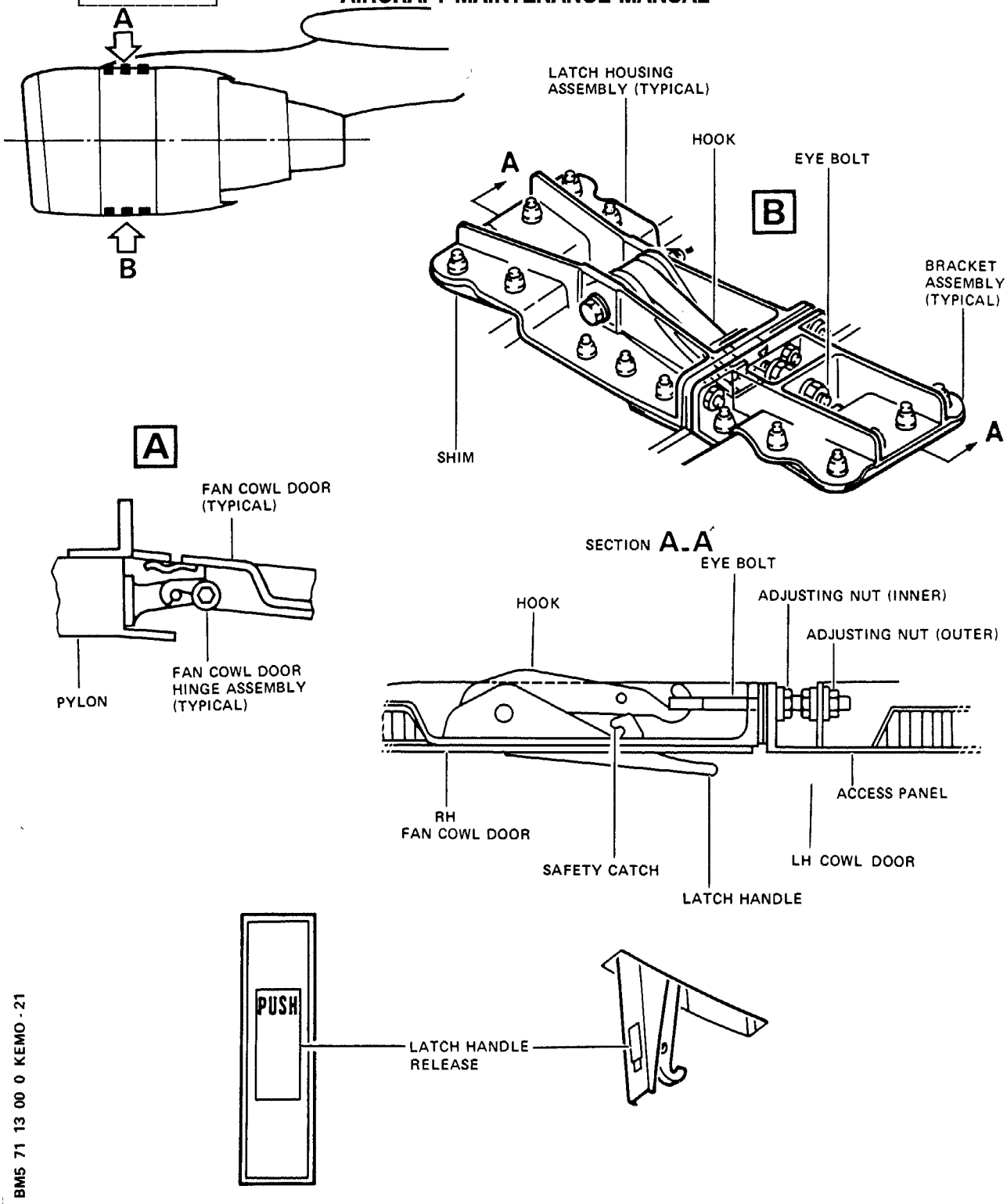
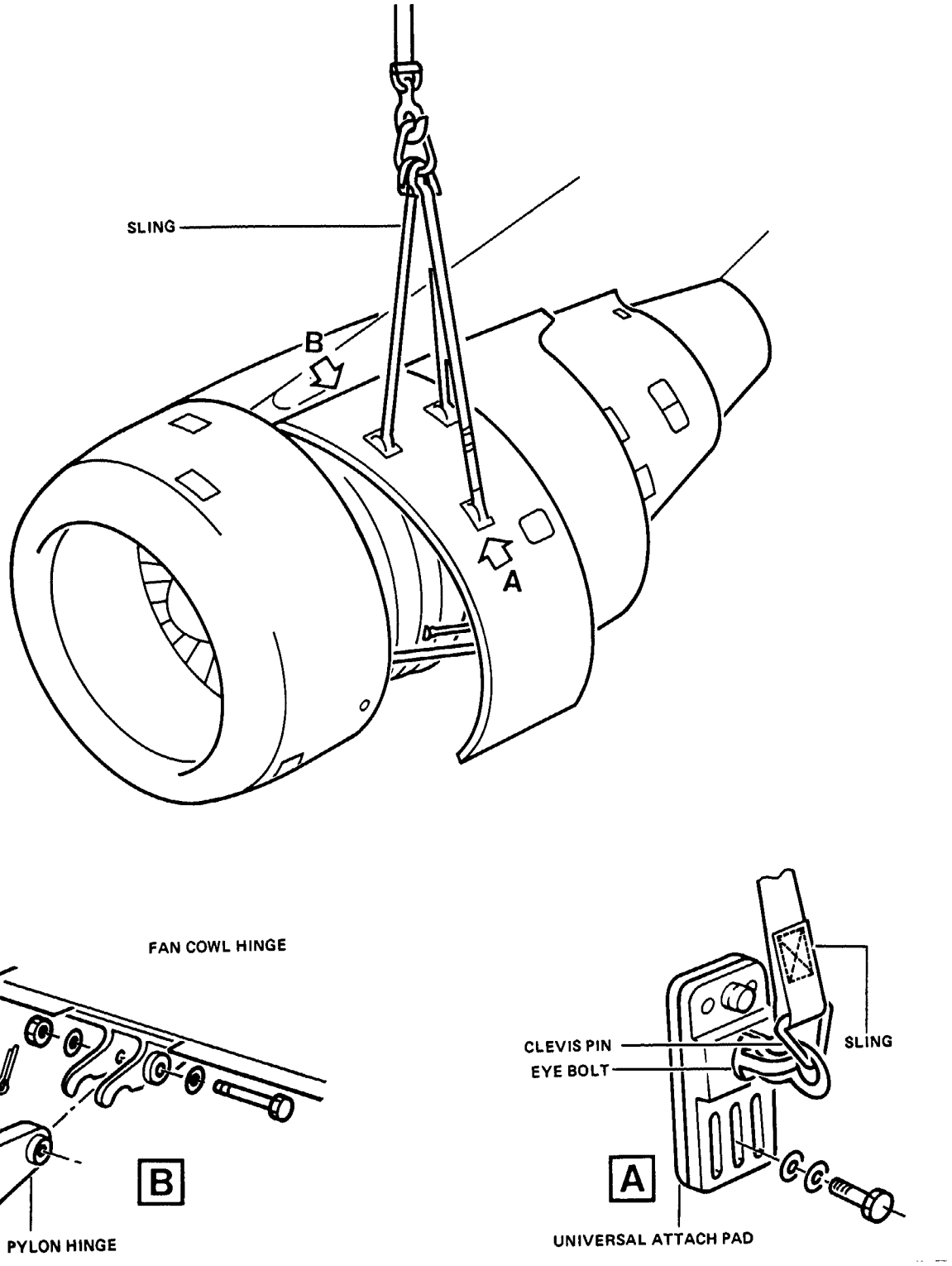
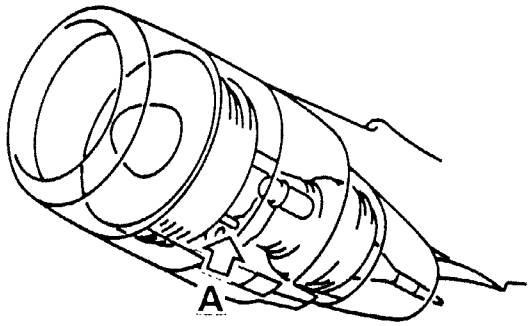
Fan Cowl
Figure 005



Fan Cowl Latches and Hinges
Figure 006



Fan Cowl Installation
Figure 007



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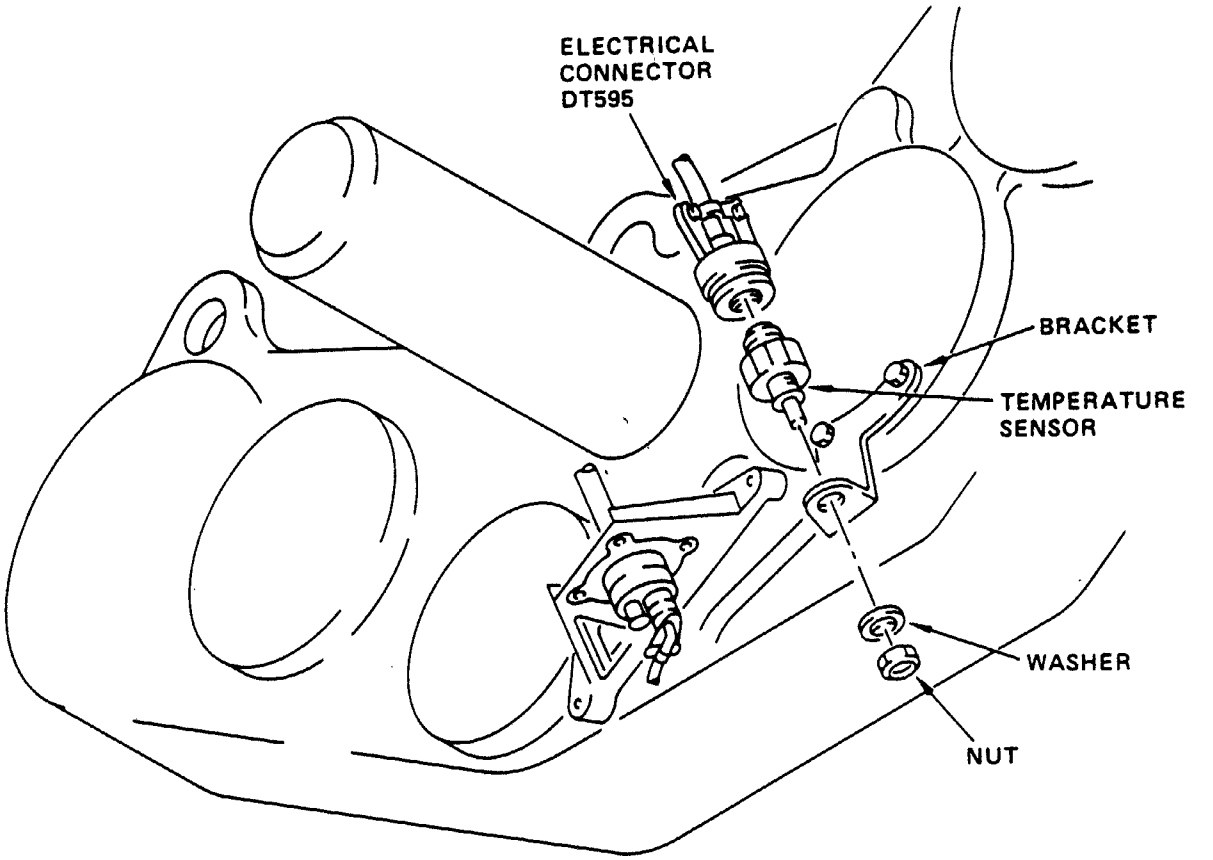

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Left Fan Cowl Doors
Figure 008

3. Thrust Reverser Cowl Doors

The thrust reverser cowl doors define the aerodynamic contours for the primary and secondary engine air flows and give access to the engine and engine core installed equipment. (Ref. Fig. 009, 010).
The main components of the thrust reverser system (translating sleeves, outer fan duct) are parts of the thrust reverser cowls that are installed in this area of the nacelle (cascades, blocker doors, actuation system (except air motor)).
The thrust reverser cowl doors are hinged in three points from the pylon (Ref. Fig. 011) and latched to each other by 6 latches of the hook tension type. (Ref. Fig. 012, 013).
For operation of thrust reverser system (Ref. 78-32).

A. The thrust reverser cowl doors are large multi-compartment doors that provide a fan air duct completely surrounding the engine core. On flight crew command, fan air can be directed rearward or forward. Because of their physical size, each door is provided with a door opening actuator which will open a door to the fully opened position at 53 degrees. Holdopen rods are provided which lock these doors open at 40 degrees only. In addition, a door closer that is stowed on the left door is used to bring both doors together so the latches can be engaged and locked. Major parts and functions of the doors are described below.
(Ref. Fig. 002, 003, 010)
(Ref. Fig. 001)

B. The thrust reverser doors are structurally integrated with the engine to perform a function called "cowl loadshare" (CLS). Without CLS, engine cases could deflect slightly at takeoff rotation, due to bending forces created by high inlet angle of attack and high fan airflows. Engine case deflection causes fan and turbine blades to machine material from their rubstrips and tip seals, resulting in loss of engine efficiency and as much as a 1.5 percent increase in specific fuel consumption.
(Ref. Fig. 014)

(1) Cowl loadshare allows the thrust reverser doors to add strength and stiffness to the engine. When completely adjusted and latched in accordance with 71-13-03, P. Block 501, the forward ends of the doors mate to the engine at "V" grooves on the fan and intermediate cases. The aft ends of the doors bear against a load-sharing T-ring on the exhaust nozzle mounting. The "case" formed by the closed thrust reverser doors stiffens the engine to maintain efficiency by preventing rubstrip and tip seal wear. The adjustment procedure also ensures that the doors close without interference with the engine and its buildup components, and that they meet aerodynamic smoothness requirements when closed.

C. The thrust reverser fan cowl directs the flow of fan air either in the forward direction or the rearward direction. When the aircraft is taxiing or in flight, fan air is directed rearward to provide fan air thrust. During the landing roll, on command of the flight crew, panels and doors on the thrust reverser direct the flow of fan air in the forward direction. This forward thrust is used to rapidly slow the aircraft without the use of brakes.

D. Dimensions : Length - 97.7 in - Max dia = 107 in.

E. Materials (Ref. Fig. 015)

F. Weight : 1507 lbs (655.5 Kg) (without air motor and drive cables)

G. Each thrust reverser door has two pressure relief doors installed at the center ot the aft section. They will open when the internal pressure of the engine core compartment air pressure is 3.0 psi (0.21 bars) greater than the external air pressure. Any combination of door openings can occur.

H. Placards and markings are placed on the exterior and interior of the thrust reverser doors to provide cautions, service data and information.

R J. Because of the size and weight of the thrust reverser doors, a closure assist device is mounted and stowed on the left door. When closing these doors, the closure assist device is attached to the right door, and a standard wrench is used to draw the doors together until the center latches can be engaged and locked. The device is then loosened from the right door and stowed on the left.
WARNING : DO NOT HOLD OPEN A THRUST REVERSER DOOR WITH THE DOOR OPENING ACTUATOR ALONE. FAILURE OF ACTUATOR CAN CAUSE SERIOUS INJURY OR DEATH.

R K. Each door has a door opening actuator. After all latches are released, a hydraulic pumping unit is attached to the actuator fitting, and engine oil is pumped through the connecting line to the actuator at the top of the door. When the door has been pumped to the 40 degree position, both hold-open rods can be attached and locked. A safety orifice is provided in the actuator which prevents a door from dropping suddenly from any position. Should support equipment or the actuator fail, a delay of approximately 15 seconds will occur from the full open position to the closed position. Regardless of this safety feature, all warnings which apply to heavy equipment must be rigorously followed.

R L. Two hold-open rods are provided for each door. Both are mounted and stowed on the door, one at the aft section and one at the forward section. When maintenance is performed in this area, these two rods are used to lock
R the door open at the 40 degree position only. When opening each door, it
R is very important, for safety reasons, to follow the hold-open rod
R attachment and removal sequence stated in the opening and closing
R procedures. If a door opening greater than 40 degrees is required, a sling attached to the door hoist points must be used. When not in use, the hold-open brackets are locked in the stowed position on brackets installed for this purpose.
(Ref. Fig. 016, 017, 018)

R M. Access doors and panels are provided which permit servicing without opening the thrust reverser cowl doors. Overpressure protection is provided by pressure relief doors which open when the internal pressure becomes 3.0 psi (0.21 bars) greater than the external pressure.

Access doors and panels are described as follows :

(1)Hydraulic filter contaminant inspect access door.
This door permits inspection of the two hydraulic filters. Pop-up plungers, which indicate when the hydraulic filters have become clogged, are readily visible through these panels.

(2)Bifurcation latch access doors. There are two latch access doors, one forward and one aft, which must be opened to unlatch the thrust reverser cowl doors. The latch access doors provide a protective cover for the bifurcation latches and a drain exit for the engine drain system. Neither of these two access doors will open under pressure.

(3)Integrated Drive Generator (IDG) oil fill and reset access door. This panel permits pressure filling of the IDG and resetting of the IDG circuit breaker.

(4)Starter manual override access panel. This panel permits manual operation of the pneumatic starter shutoff valve.

(5)Engine oil filling access panel. This access door is provided to allow filling of the engine oil tank without opening the thrust reverser doors.

(6)Ground air connection. The ground air connection, for operating the thrust reverser on the ground, is made through the upper pressure relief door on the left thrust reverser door.

R N. Seals and Fire Seals

(1)V-grooves and V-blades : The thrust reverser door is sealed with a system of V-grooves, V-blades and composite seals around the forward edges of both the outside and the inside sections which form the input opening of the fan air duct. The outside section, is sealed at three places ; one, on the engine fan case by mating door V-blades into V-grooves of the fan case, two, on the edge of the fan duct with composite seals, and three with the fan cowl doors which mate with a recessed groove in the forward edge of the thrust reverser door.
The inside section is also sealed around the complete circumference with an identical system of V-grooves and V-blades in addition to composite seals just aft of the grooves and blades. These seals, with the addition of the fire seals on the anti-ice duct which transits between the engine core compartment and the fan case compartment, provide a complete compartment-to-compartment seal.

(2)Aft edge seal. The aft edge of the thrust reverser door is sealed with a continuous rubber bumper seal which presses into the aft end of the engine core and mates against the pylon at the top.

(3)Thrust reverser doors are sealed at the top by sheet metal seals and at the bottom by a combination of rubber and metal seals.

(4)Fire seals. Fire seals are provided around the anti-icing duct between the fan cowl compartment and the engine core compartment. These fire seals, in addition to seals on the forward edges of the thrust reverser doors completely seal the fan case compartment from the engine core compartment.

R P. Each door contains five groups of sling hoist points.
Three are used to attach a sling when a thrust reverser door is removed, installed, or must be held open at a position greater than 40 degrees. An attached sling must be used when hold-open rods are removed or

installed. The remaining two groups are used for handling the thrust reverser translating sleeve. All points, when not in use, have hoist point plugs installed which fit flush with the nacelle surface and in addition, prevent foreign objects from entering and lodging in the hoist point openings.

R Q. There are five latch assemblies and two manual load share toggles that secure the thrust reverser doors for flight.

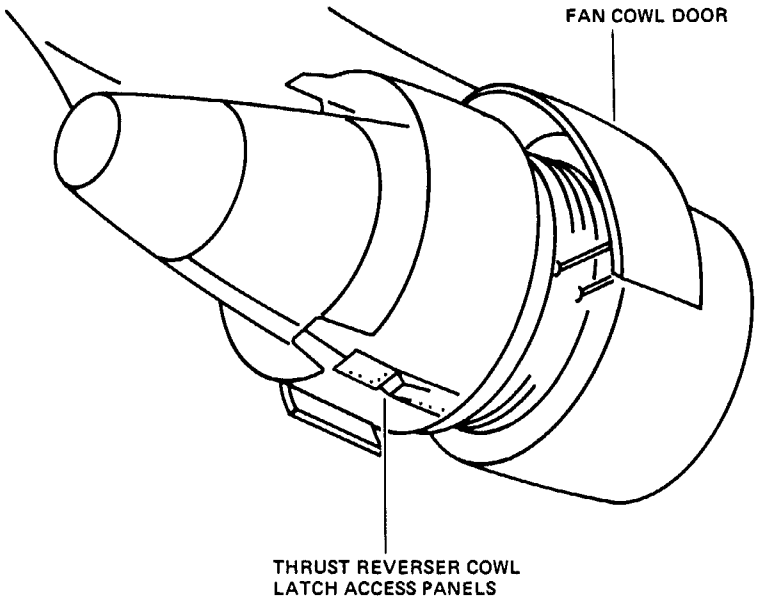
(1) Three bifurcation latches lock the bottom centers of the thrust reverser doors. The handles and hooks are installed on the left door and the eyebolts on the right.

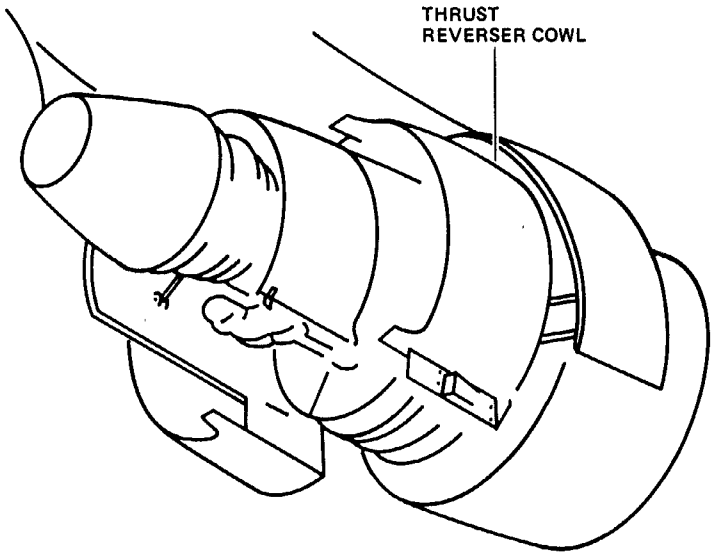
(2) Two forward circumferential latches connect titanium straps at the forward edge of each thrust reverser door to a connecting strap suspended from the bottom center of the fan case. When both are latched, the forward circumference of the thrust reverser is banded to mate tightly to the engine fan and intermediate cases.

(3) The aft circumferential latch connects the lower ends of the rearmost thrust reverser door frames. Toggle latch pins near the top of each door engage in receivers at both ends of a tension strap. The tension strap is mounted across the top of a T-ring that is part of the engine exhaust nozzle. When the aft circumferential latch and both toggle pin latches are properly adjusted and closed, a continuous band is formed which brings the aft circumference of the thrust reverser to bear on the engine nozzle T-ring.

R R. Bleed air. The thrust reverser doors bleed fan air to pressurize the pneumatic system, to operate the thrust reverser the anti-ice system, and to provide engine cooling. In addition, bleed air provides cabin pressurization and cooling.

R S. Hinges with pylon hinge hook. The thrust reverser doors are hinged at the top with three hinges. The center hinge if formed as a hook to engage the pylon center hinge bolt to facilitate the removal and installation of these doors.





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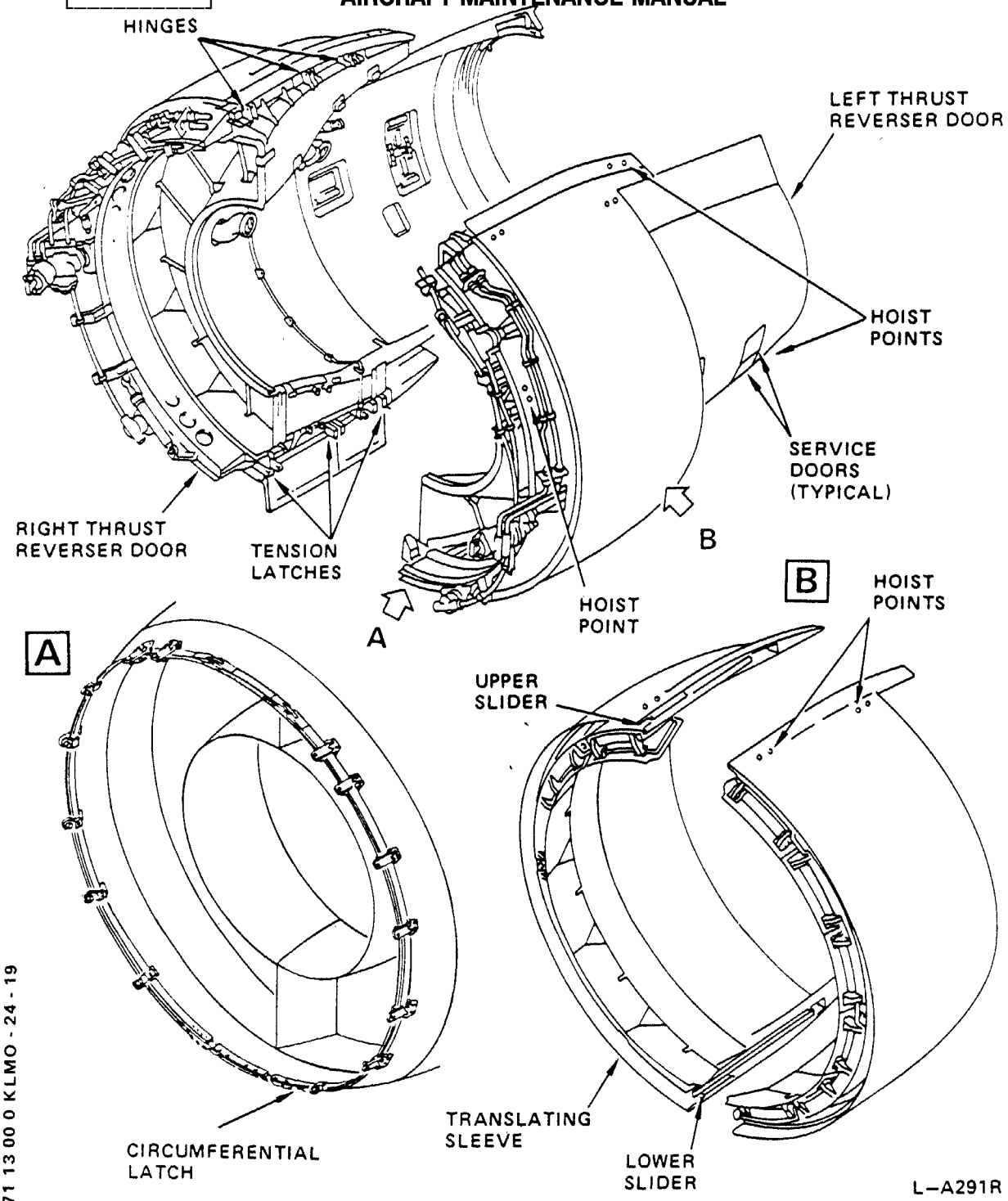
Quick Access to Core Engine
Figure 009



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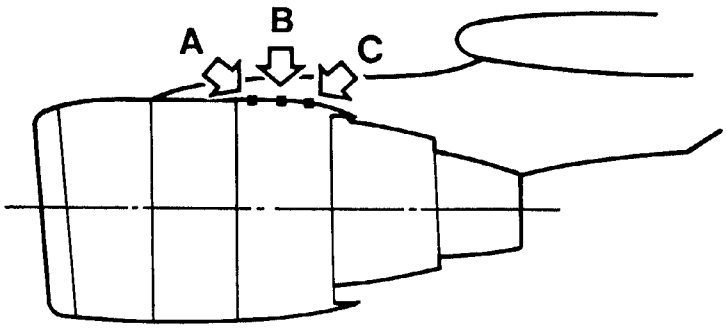
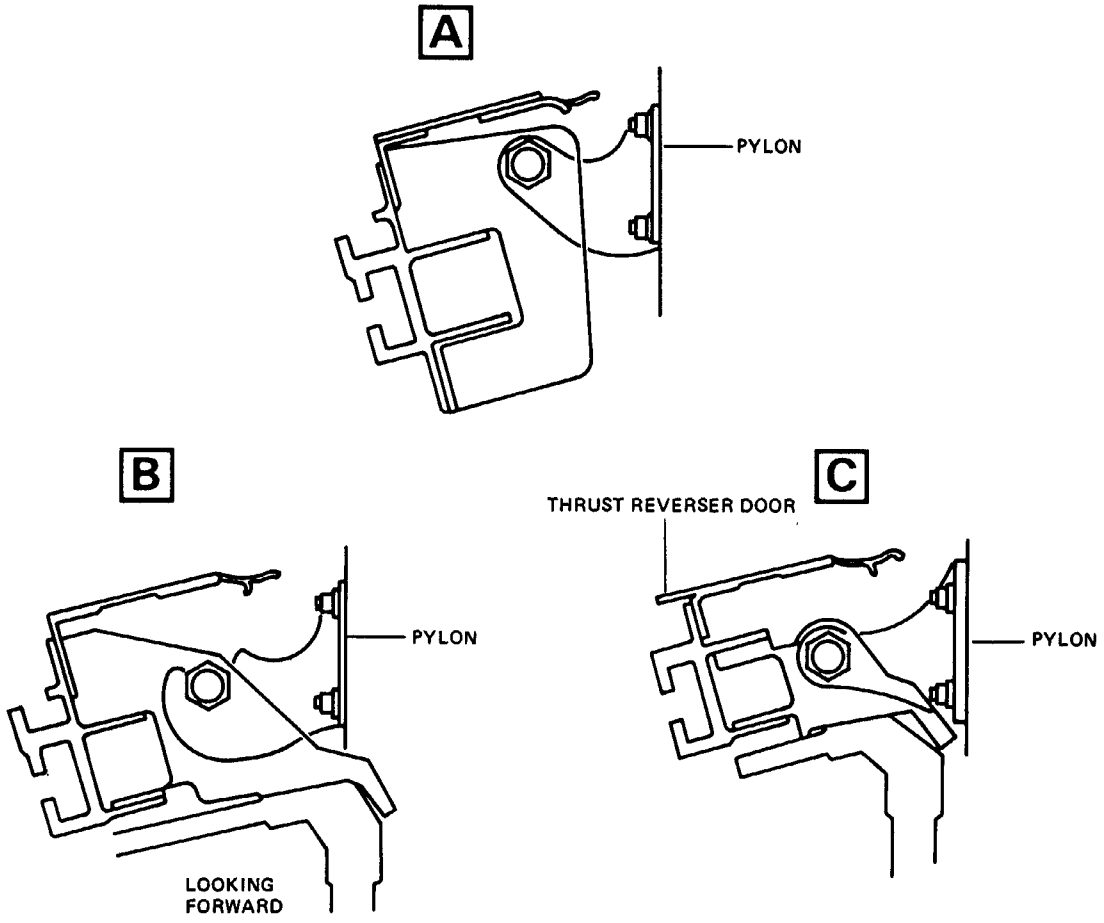
Thrust Reverser Cowl
Figure 010





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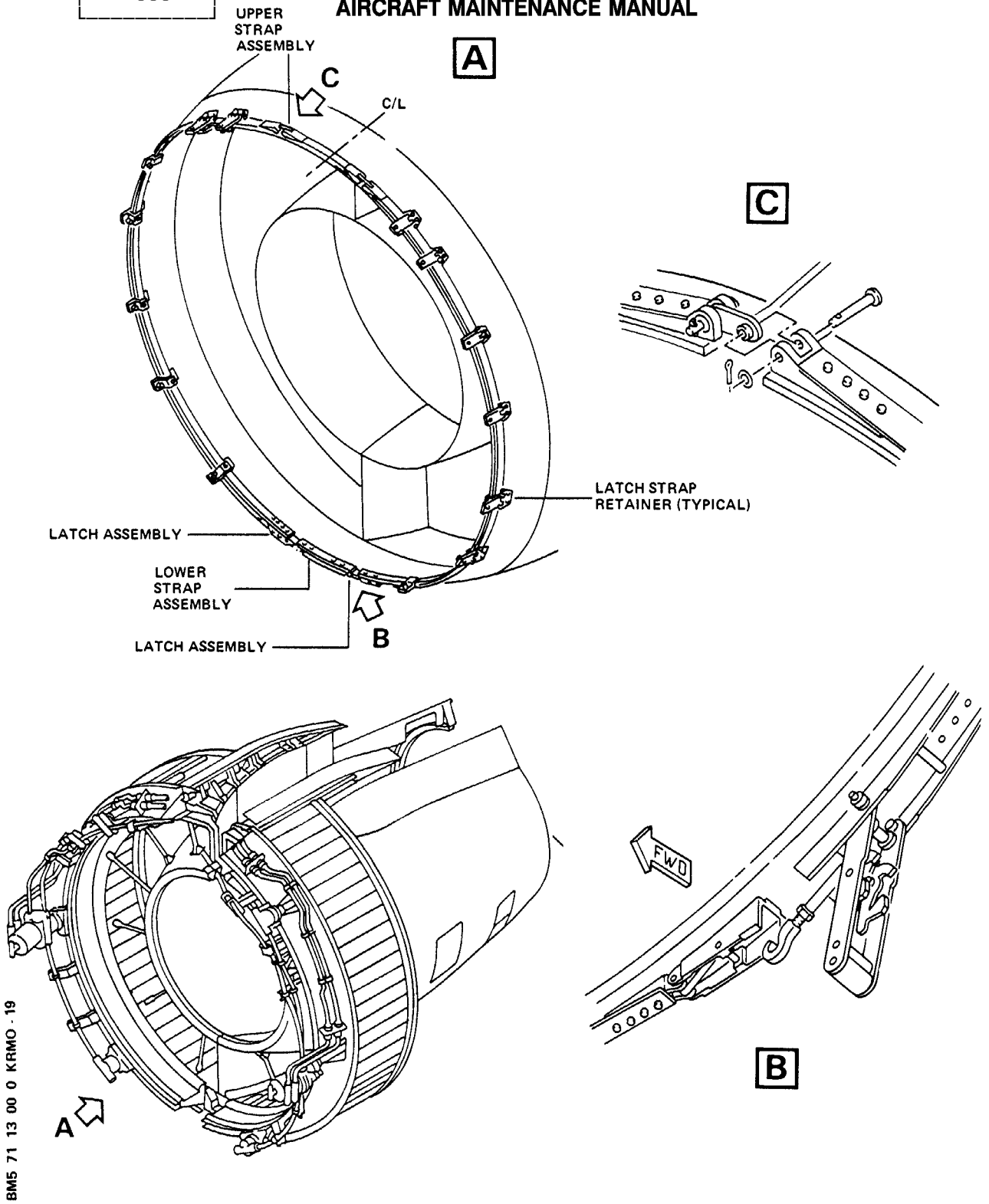
Thrust Reverser Hinge
Figure 011



Front Circumferential Strap and Latch
Figure 012

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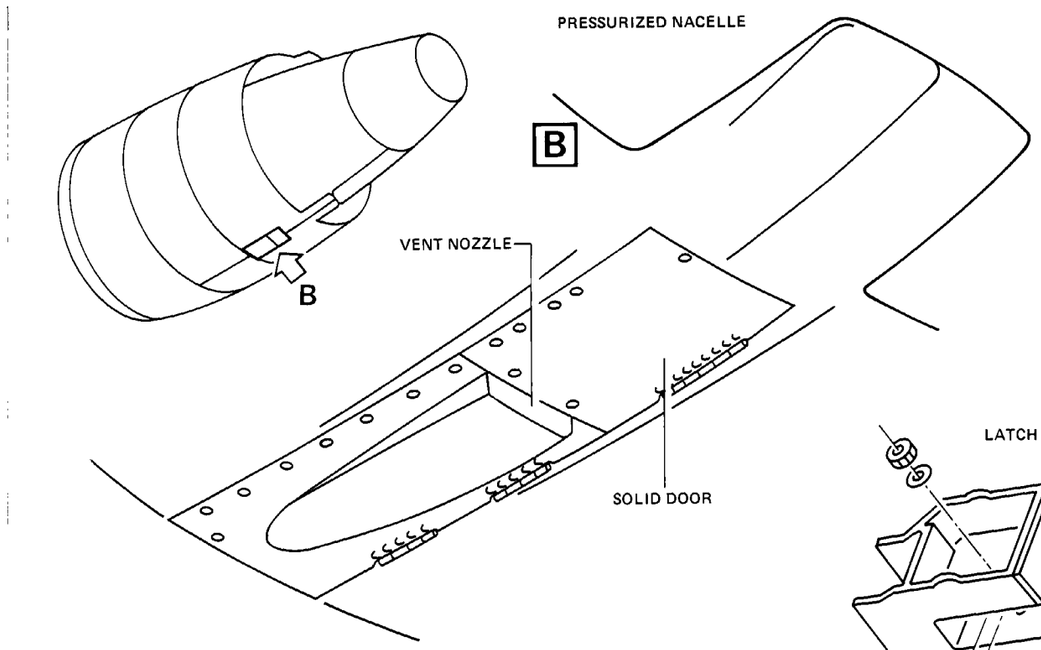

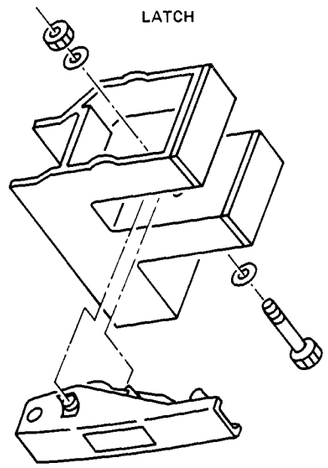

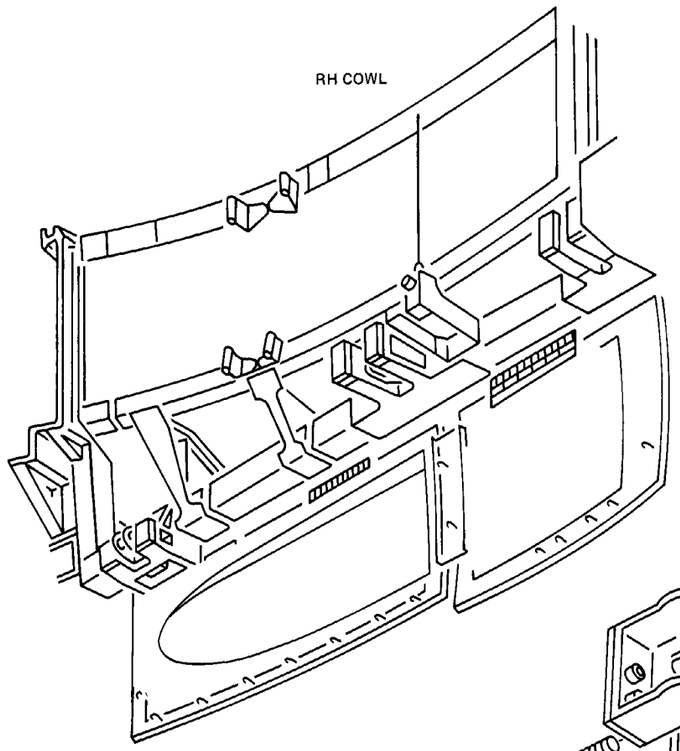

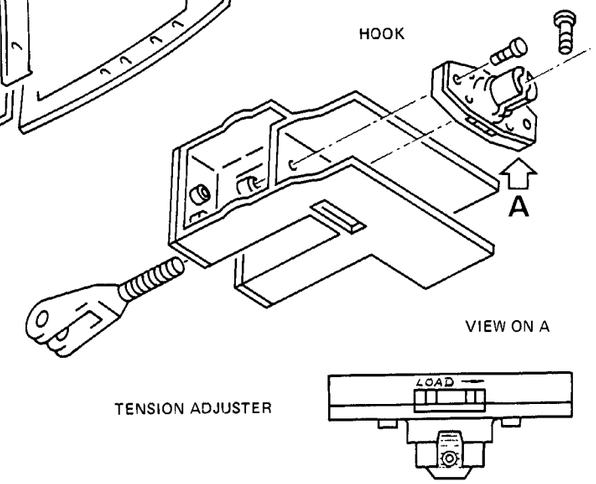

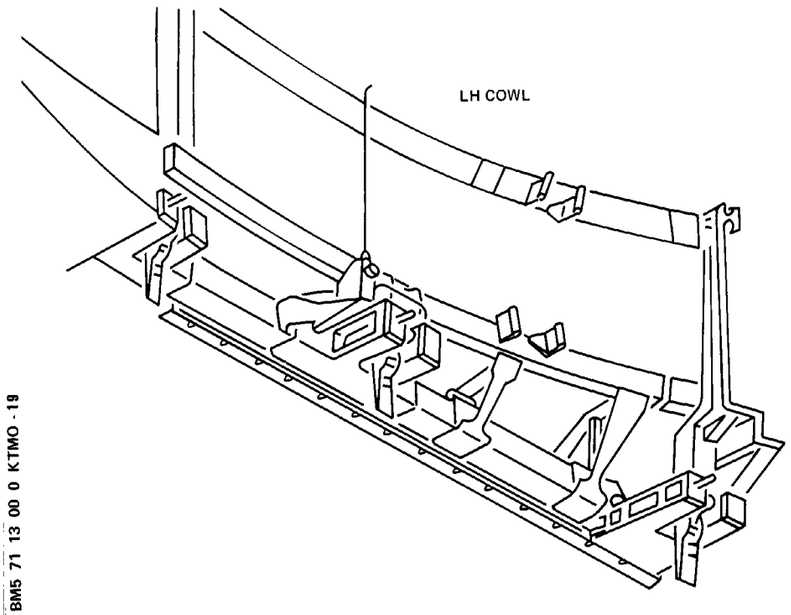

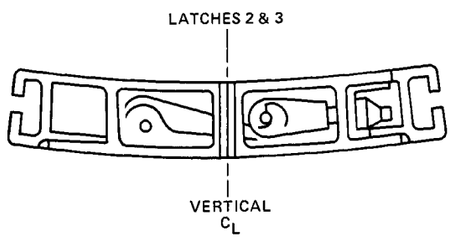

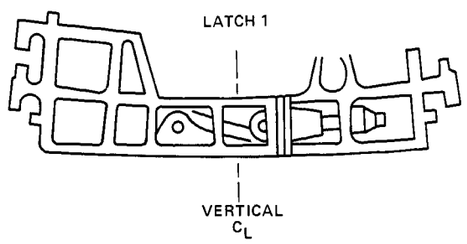

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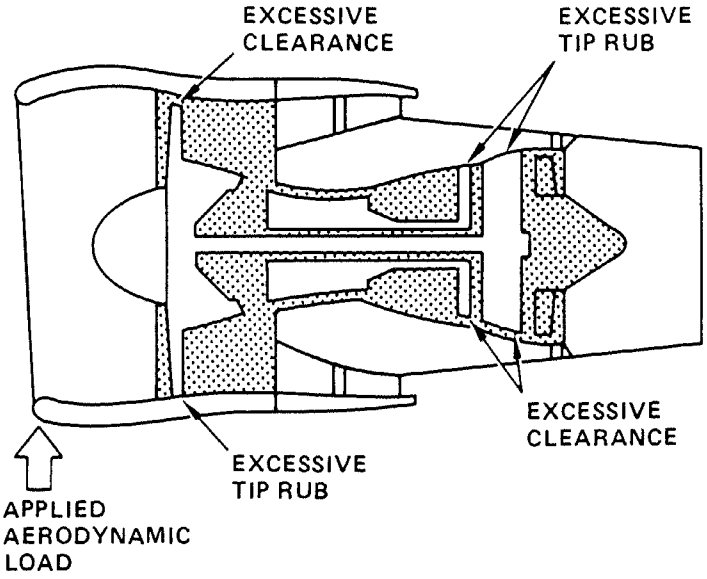
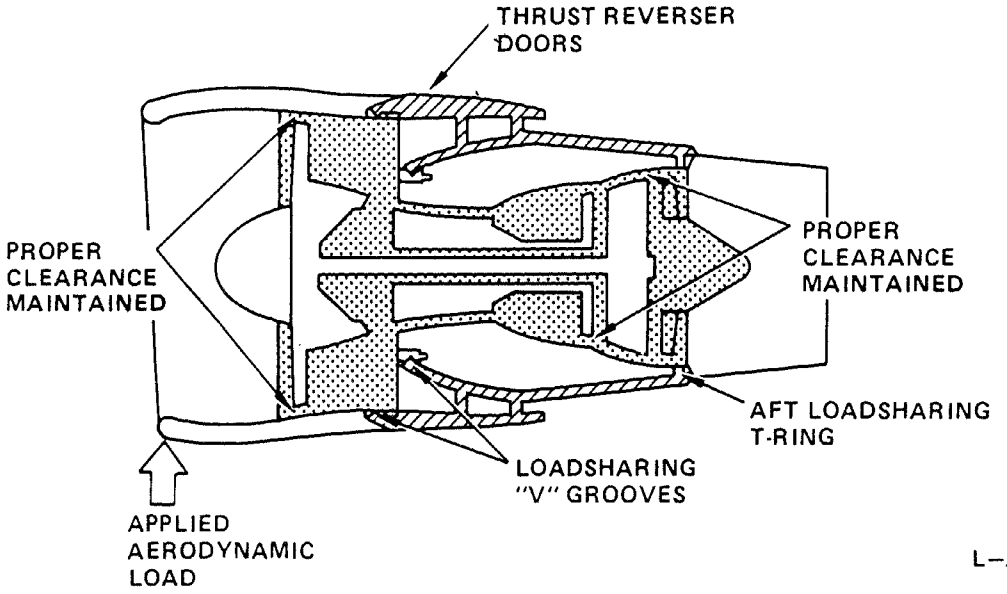
Thrust Reverser Door Latches
Figure 013

NACELLE WITHOUT COWL LOADSHARING



NACELLE WITH COWL LOADSHARING



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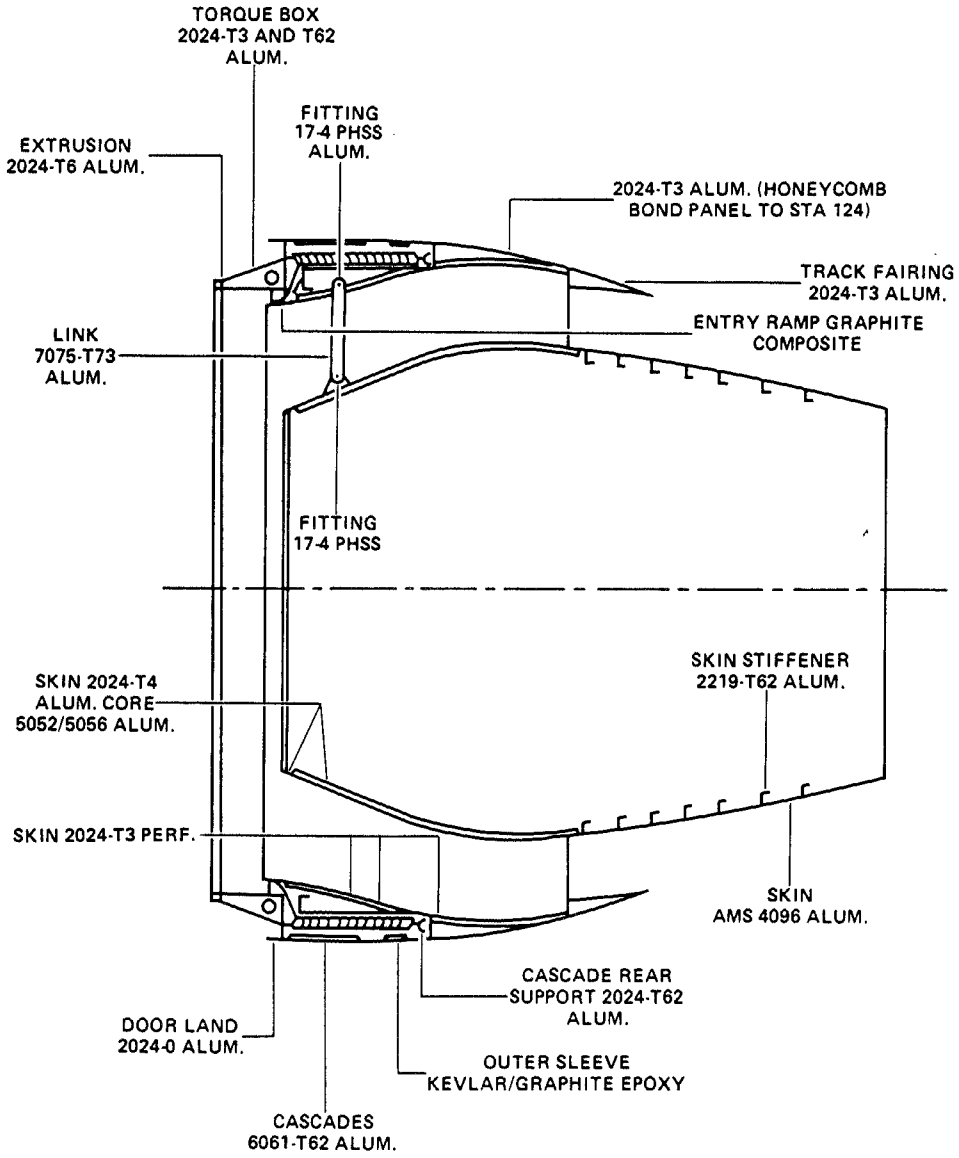
Cowl Loadshare Function
Figure 014



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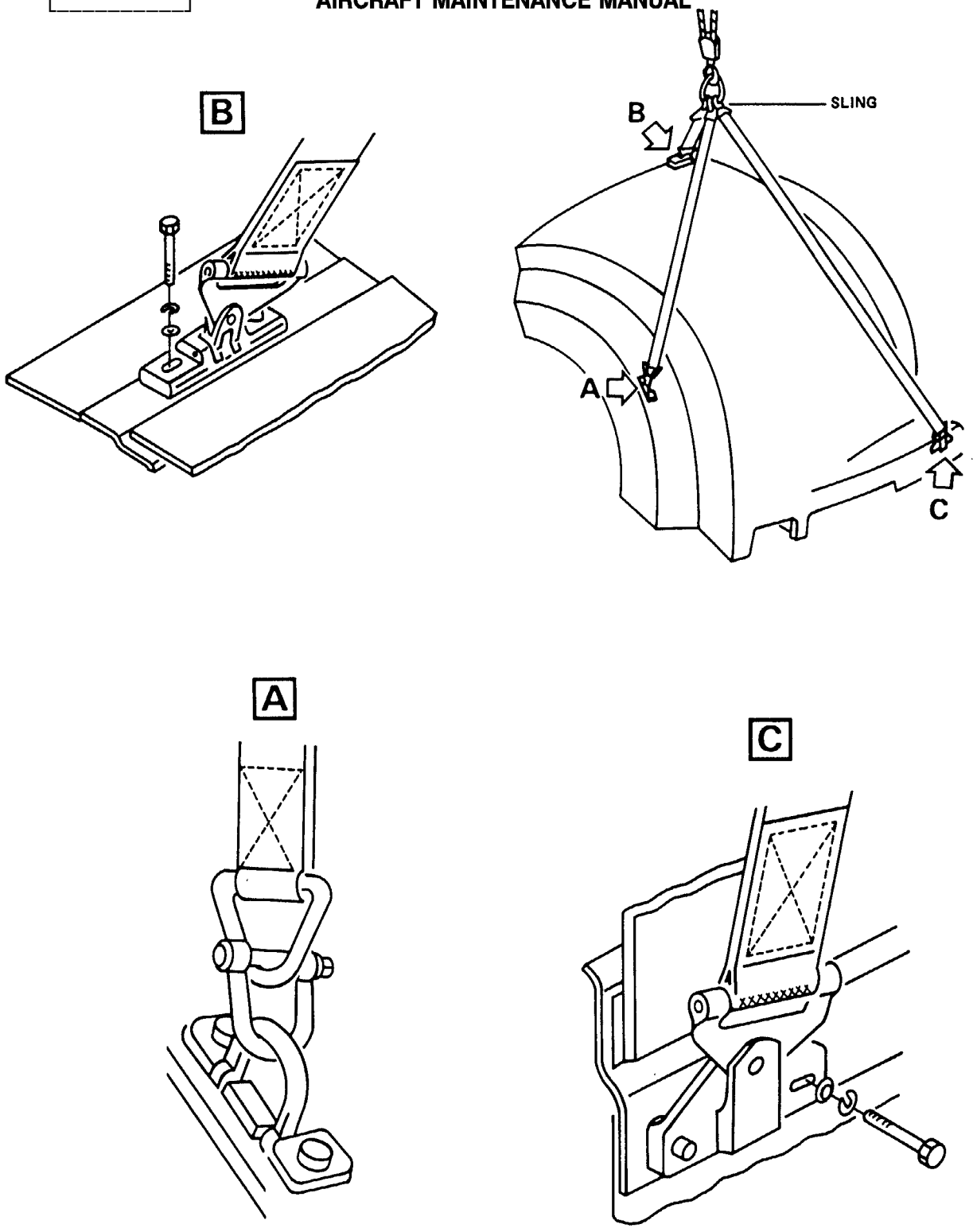
Thrust Reverser Cowl Composite Construction
Figure 015



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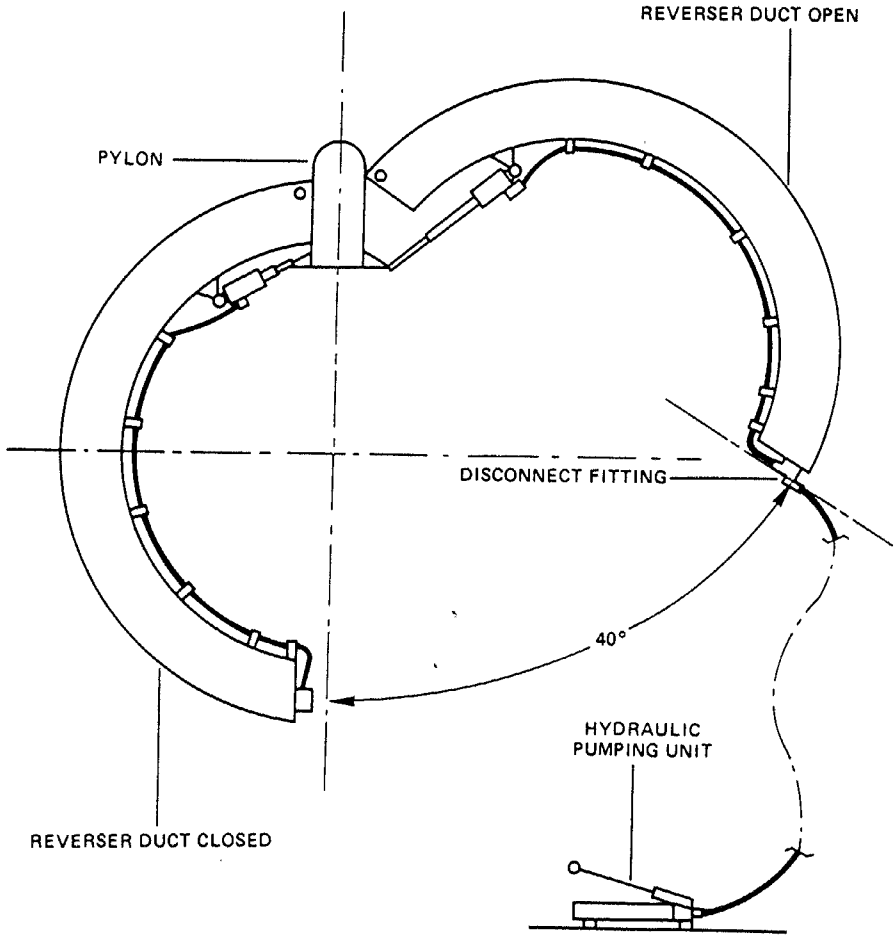
Thrust Reverser Cowl Hoist Points
Figure 016



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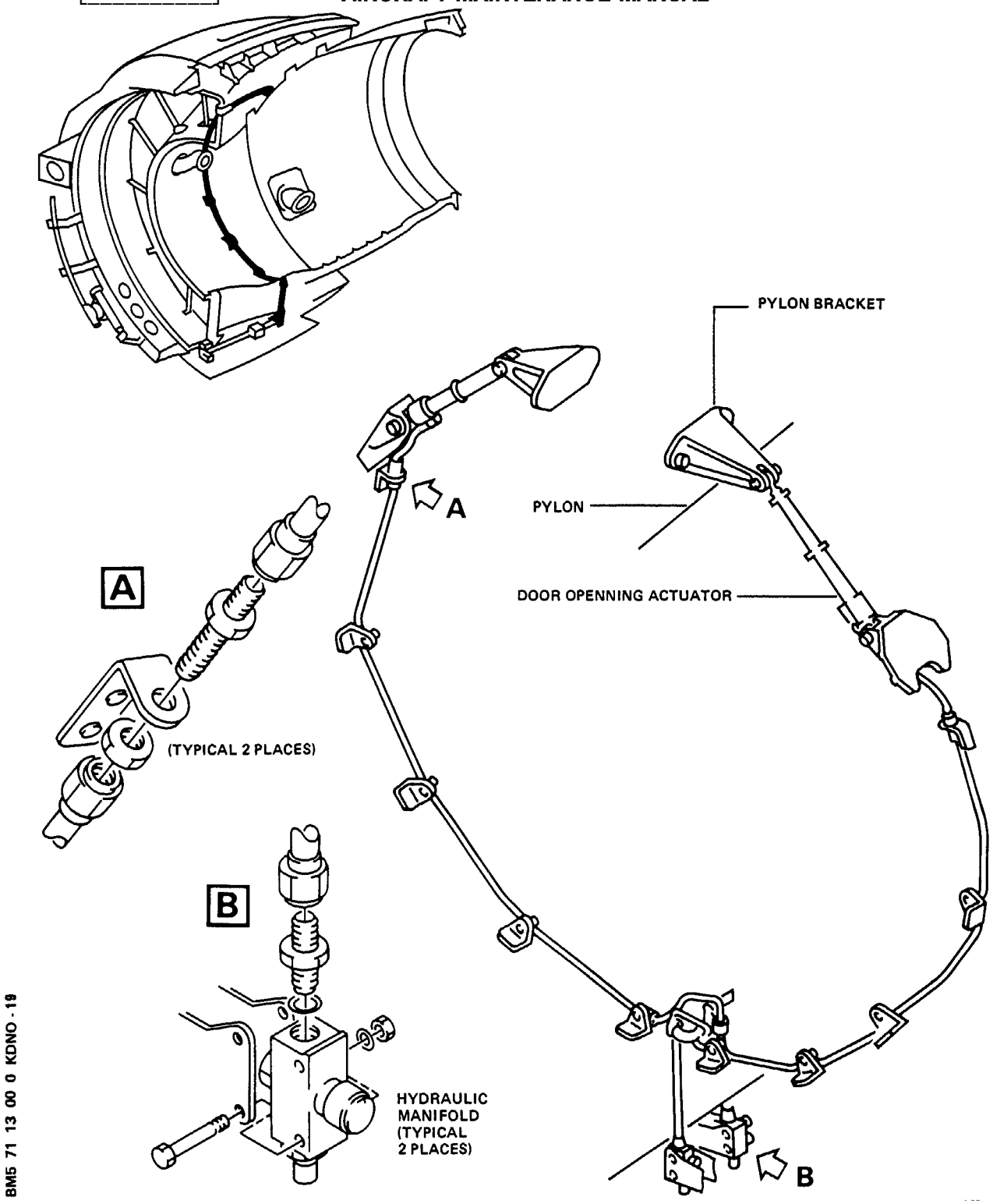
Thrust Reverser Cowl Opening System
Figure 017



Thrust Reverser Cowl Opening Actuating Mechanism
Figure 018

COWL DOORS - SERVICING

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. RSE1002	Hydraulic Pump - Hand Operated
OR	
C. RSE1111	Hydraulic Pump - Hand Operated
D. Material No.P04-001	Common Greases (Ref. 70-00-00)
Referenced Procedures	
- 71-13-02, P. Block 501	Fan Cowl
- 71-13-03, P. Block 201	Cowl Doors
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl
R - 78-36-02, P. Block 401	Thrust Reverser Door Opening Actuator Manifold

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG2/REVERSE/CTL	2KM	331/V74
133VU	ENGINES/ENG1/REVERSE/CTL	1KM	332/U69
133VU	ENGINES/ENG1/FUEL HP VALVE/CTL	3KC	333/T69
133VU	ENGINES/ENG2/FUEL HP VALVE/CTL	4KC	333/T70
133VU	ENGINES/ENG2/IGNITION/SYS A	8JH	333/T71
133VU	ENGINES/ENG1 & 2/IGNITION/SYS B	2JH	333/T72
133VU	ENGINES/ENG1/IGNITION/SYS A	1JH	334/S72
133VU	ENGINES/ENG1 & 2/START/CTL & WARN	1KG	335/R68

3. Fan Cowl Door Opening and Closing

A. Open Fan Cowl doors (Ref. Fig. 301, 302)

CAUTION : DO NOT OPEN FAN COWL DOORS IF GROUND WIND VELOCITIES EXCEED 40 KNOTS. DO NOT LEAVE DOORS OPEN IF GROUND WIND VELOCITIES EXCEED 60 KNOTS. WINDS IN EXCESS OF THESE VELOCITIES WILL CAUSE OVERSTRESS AND POSSIBLE FAILURE OF DOORS, OPENING AND HOLD-OPEN DEVICES, OR ASSOCIATED HARDWARE.

(1)Press fan cowl door latch trigger to release latch handle and pull each handle down to release tension latches.

(2)Manually lift and support door at lower edge. Retract knurled knob on rod to release hold-open rod from retention bracket.

NOTE : Forward hold-open rod is stowed on fan cowl door. Aft hold-open rod is stowed on engine fan case.

(3)Depress first lock (marked PUSH), turn approximately 1/4 turn to release. Manually extend first section to fully extended and locked position.

NOTE : Spring-loaded lock will automatically engages causing red band marked UNLOCKED to disappear.

(4)Repeat above procedure for second section.

(5)Retract knurled knob on end of rod and engage on support fitting (Ref. Fig. 301)

B. Close Fan Cowl Doors (Ref. Fig. 301, 302)

CAUTION : RELIEVE WEIGHT OF FAN COWL DOOR FROM HOLD-OPEN ROD PRIOR TO RELEASING THUMB LOCK LATCH. DO NOT ATTEMPT TO FORCE LATCH TO RELEASE. FAILURE TO COMPLY MAY CAUSE DAMAGE TO RELEASE LATCH AND RENDER HOLD-OPEN ROD UNUSABLE.

CAUTION : CLOSE AND SECURE THE THREE FAN COWL LATCHES IN A SEQUENCE OF FRONT TO BACK OR BACK TO FRONT WHEN CLOSING THE FAN COWL DOORS. MAKE SURE THAT ALL THREE LATCHES ARE CLOSED AND SECURE BEFORE FLIGHT. FAILURE TO CLOSE ALL THREE LATCHES BEFORE FLIGHT MAY RESULT IN THE FAN COWL OPENING DURING FLIGHT.

CAUTION : DO NOT USE TOOLS TO OPEN OR CLOSE THE FAN COWL LATCHES. THIS CAN CAUSE DAMAGE TO THE FAN COWL LATCHES.

NOTE : Thrust reverser doors must be closed before initiating fan cowl door closing sequence.

(1)Check the integrity of the fan cowl latches before closing them.

(2)Retract first knurled knob on rod to disengage forward or aft rod from support fittings.

(3)Depress locks (marked PUSH) and turn lock 1/4 turn to release. Retract rod (one section at a time) to minimum length.

(4)Return stowed rod to retention bracket; Forward rod on fan cowl door, and aft rod on fan case.

(5)Retract knurled knob to engage rod on retention bracket. Manually check for complete engagement.

(6)Push fan cowl doors together at cowl centerline and engage tension latch hooks with eye-bolts on opposite door.

(7)Manually engage tension latch handle into locked positions flush with door surface. Handle will remain in locked position.

(8)Adjust fan cowl alignment plate (Ref. 71-13-02, P. Block 501).

4. Thrust Reverser Cowl Door Opening and Closing

A. General

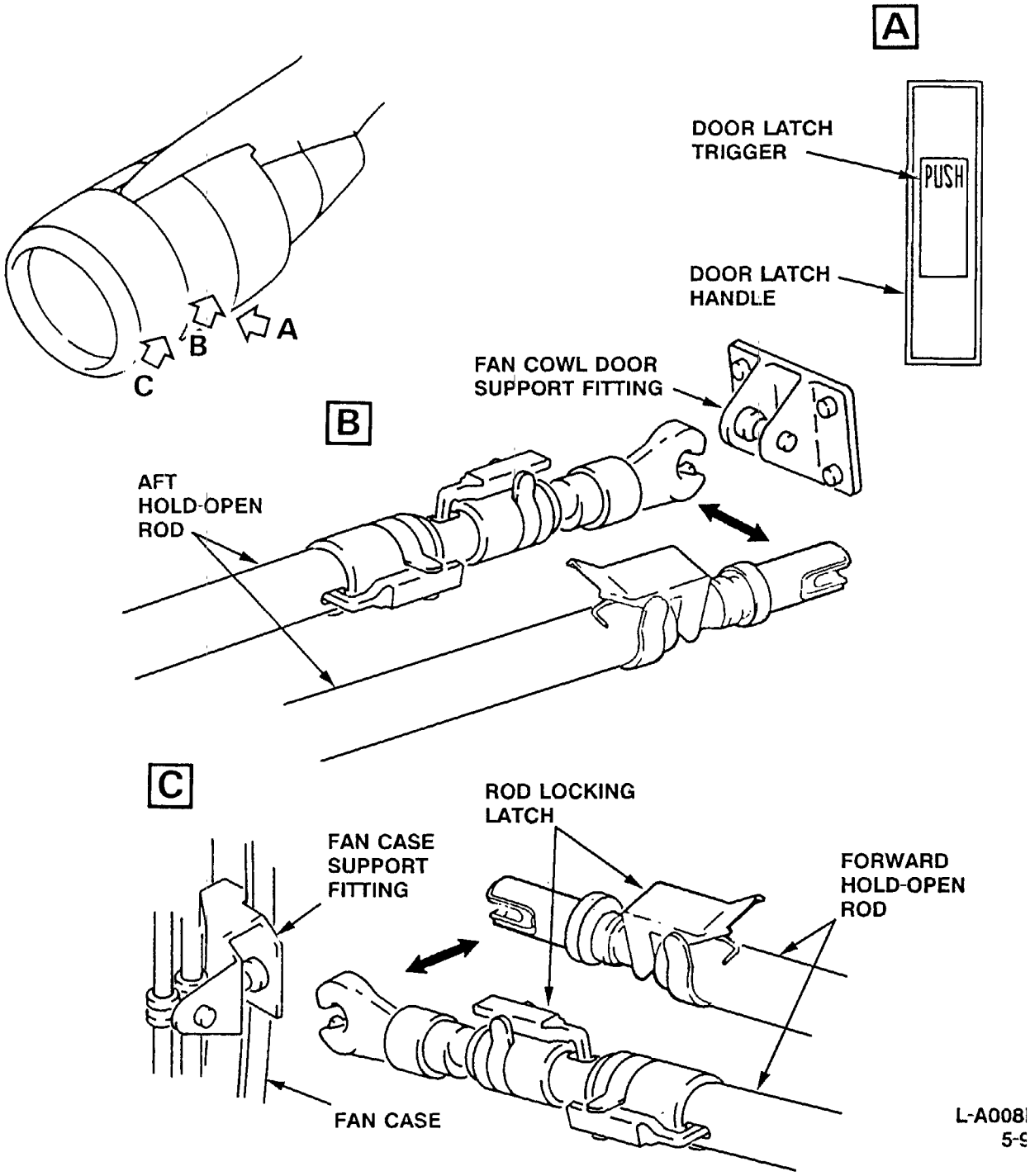
Opening thrust reverser door requires opening fan cowl doors (Ref. Paragraph 3).

B. Open Thrust Reverser Door (Ref. Fig. 303, 304)

NOTE : Opening procedures are identical for left and right thrust reverser door.

CAUTION : THE FOLLOWING PROCEDURES ARE TO BE DONE TO PREVENT DAMAGE TO THE CLOSURE ASSIST DEVICE.

CAUTION : DO NOT OPEN THRUST REVERSER DOORS IF GROUND WIND VELOCITIES EXCEED 40 KNOTS. DO NOT LEAVE DOORS OPEN IF GROUND WIND VELOCITIES EXCEED 60 KNOTS. WINDS IN EXCESS OF THESE VELOCITIES WILL CAUSE OVERSTRESS AND POSSIBLE FAILURE OF DOORS, OPENING AND HOLD-



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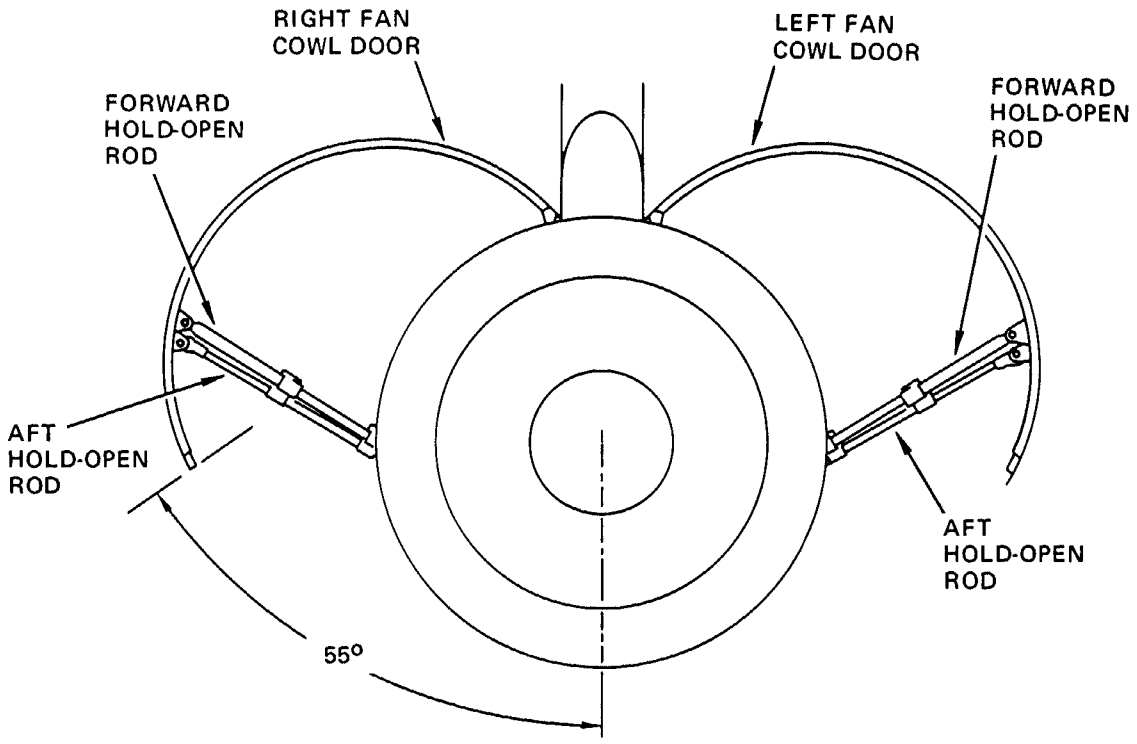
Fan Cowl Door Opening and Closing
Figure 301



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Fan Cowl Door Opening and Closing
Figure 302

OPEN DEVICES, OR ASSOCIATED HARDWARE.

(1)Open fan cowl door to the full open position (Ref. Paragraph 3-A).

(2)Adjust closure assist device to its minimum lenght.
(Ref. Fig. 305)

(a)Detach free end of turnbuckle from storage clamp.

(b)Turn the barrel counterclockwise about the attached end fitting until the fitting bottoms out in the barrel.

(c)Hold the barrel and turn the free end fitting into the barrel until it bottoms out.

(3)Attach closure assist device free end to the right thrust reverser door.

(a)Keep the free end fitting from turning and turn the barrel to lenghten closure assist device until the pin on the free end fitting can engage hook on right thrust reverser door.

NOTE : Adjust both threaded ends of closure assist device until equal area of threads are exposed on each side of barrel.

(b)Pull the doors together by turning the barrel using an open end wrench or equivalent.

(4)Unlock thrust reverser door latches as follows.
(Ref. Fig. 303)

(a)Unlock aft circumferential door latch.

(b)Unlock left or right front circumferential strap latch.

(c)Open latch access doors at lower center bifurcation area of thrust reverser doors.

(d)Unlock forward and aft (bifurcation) tension latches at lower bifurcation.

(e)Unlock center bifurcation tension latch.

NOTE : It is not necessary, nor is it advisable, to manually unlock the aft cowl load share toggle latches when opening the thrust reverser doors. The toggle load share latches automatically unlock and release after all door latches are unlocked and the thrust reverser door is jacked partially open. However, if a toggle latch handle must be manually opened, press a small rod or tool through slot in the latch handle while applying a force circumferentially downward on the lock pin to release the handle. If the latch handle does not spring up, apply radial hand pressure to the latch while pushing down on the lock pin. Do not apply a force radially inward on the lockpin, and do not pry on the handle with a screwdriver.

(Ref. Fig. 306)

WARNING : MAKE CERTAIN THAT HYDRAULIC PUMP IS PROPERLY CONNECTED TO THE THRUST REVERSER MATING CONNECTOR BY PULLING ON PUMP HOSE WITH MODERATE FORCE. THE CONNECTION MUST BE MADE CORRECTLY, OTHERWISE THRUST REVERSER DOOR OPENING SYSTEM WILL NOT BE PRESSURIZED. REVERSER DOOR COULD PARTIALLY CLOSE UNEXPECTEDLY IF THE HOLD-OPEN ROD LOCKING COLLARS ARE RELEASED, OR FULLY CLOSE IF THE HOLD-OPEN RODS ARE DISCONNECTED FROM ENGINE BRACKETS.

(5)Detach closure assist device from quick-disconnect clamp on right thrust reverser door.
(Ref. Fig. 305)

(a)Turn the barrel to lenghten device until free end fitting can be disengaged from hook.
(b)Hold free end fitting and turn barrel to shorten lenght of closure assist device, if necessary, so that it can be re-stowed in its stowage bracket.

(6)Release all latches holding left and right thrust reverser doors together.

R WARNING : DO NOT HOLD THE THRUST REVERSER DOOR OPEN WITH THE DOOR OPENING ACTUATOR ALONE. FAILURE OF ACTUATOR CAN CAUSE SERIOUS INJURY OR DEATH.

R CAUTION : USE ONLY THE RSE1002 OR RSE1111 HAND OPERATED HYDRAULIC PUMP UNIT OR AUTHORIZED EQUIVALENT TO LIFT THE THRUST REVERSER COWL DOORS.

R (7)Connect RSE1002 or RSE1111 Hand-Operated Hydraulic Pump.
R (a)Verify that the manifold lockwire is there. The Eaton-Sterer identification seal must be there and lockwire intact (Ref. Fig. 304).
R (b)If the manifold lockwire is missing or altered, it is recommended that the manifold be removed and calibrated or replaced. Do this before you use the Hand-Operated Hydraulic Pump.
R To remove and install the manifold, (Ref. 78-36-02, P. Block 401).
R To recalibrate the manifold, refer to Vickers CMM 78-30-02, Door Opening - Manifold Assembly.
R (c)Connect the hand-operated hydraulic pump (RSE1002 or RSE1111) to the manifold quick-disconnect fitting (Ref. Fig. 304). The quick-disconnect fitting is aft of the center bifurcation latch. If required, service the pump with lubricating oil (Material No.P03-001).
R NOTE : For the RSE1002 or RSE1111 pump, the internal pressure relief requirement is between 3600 and 3800 psig (24800 and 26200 kPa) and the reseat pressure is between 3000 and 3400 psig (20700 and 23400 kPa).

R WARNING : PULL ON THE HYDRAULIC PUMP HOSE TO MAKE SURE THE HYDRAULIC PUMP HOSE IS CORRECTLY CONNECTED TO THE DOOR CONNECTOR. IF THE PUMP HOSE IS NOT CORRECTLY CONNECTED, THE DOOR ACTUATOR WILL NOT PRESSURIZE. THE DOOR CAN CLOSE SUDDENLY IF IT IS NOT HELD OPEN BY HOLD-OPEN RODS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

R (8)Operate the hand-operated hydraulic pump to open the thrust reverser door. Open the door sufficiently to get access to the FORWARD hold-open rod.

R WARNING : FOLLOW THE HOLD-OPEN ROD ATTACHMENT SEQUENCE FOR ADDED SAFETY. DO NOT ATTACH THE AFT HOLD-OPEN ROD UNTIL YOU SAFELY ATTACH THE FORWARD HOLD-OPEN ROD IN FULL OPEN LOCKED POSITION IN THE LOCK GROOVE.

R (9)Release FORWARD hold-open rod from the thrust reverser door retention bracket. Depress thumb-lock latch on the rod, and extend hold-open rod required length to attach to engine support bracket. DO NOT attach aft hold-open rod at this step.
R NOTE : Release latch will drop into the lock groove on the hold-open rod when the proper opening position is obtained.
R (10)Continue to operate the hand-operated hydraulic pump to raise the thrust reverser door. Do this until the thumb-lock latch on the FORWARD

R hold-open rod locks in the lock groove. For post SB PW4NAC 71-99
R hold-open rods, make sure the green band is visible when you look
R directly at the thumb-lock latch trigger.
R (11)Release AFT hold-open rod from the thrust reverser door retention
R bracket. Depress thumb-lock latch. Extend hold-open rod until thumb-
R lock latch locks within locking groove. Attach hold-open rod to
R engine support bracket.
R (12)Slowly release pressure from RSE1002 or RSE1111 hand-operated hydraulic
R pump to lower the thrust reverser door. Do this until the weight of the
R door is on the hold-open rods.
R CAUTION : MAKE SURE YOU LET THE FLUID DRAIN FOR SIXTY (60) SECONDS
R BEFORE YOU REMOVE THE HAND-OPERATED HYDRAULIC PUMP HOSE.
R PRESSURE BUILD-UP IN A CLOSED SYSTEM CAN CAUSE DAMAGE TO
R EQUIPMENT.
R (13)Disconnect the hand-operated hydraulic pump from the quick-disconnect
R fitting.
R NOTE : The hold open rods are not designed to be utilized at the engine
R removal open position of 53°.

C. Cowl Inspection

Check cowls and parts for security of attachment and correct condition

- hinges and hinge pins
- doors and cowl lower section for proper operation
- U-bolts for attachment and latch triggers for correct operation (check springs and pins for condition)
- upper latch hook for proper attachment
- forward latching system for attachment and correct condition (check ring attachment, cable and actuating mechanism)
- gutters and fire shields for condition
- pressure relief doors on fire bulkhead and retention cables for correct positioning
- check components located inside thrust reverser cowls for delamination (pipes, ducts, stainless steel skin and travel range limiter attachment)
- engine/cowl seating surfaces for condition
- air cooling outlets for obstruction.
- visually inspect thrust reverser hydraulic opening system.
- on both forward circumferential latches : inspect latches for excessive wear on latch hooks, receivers, hinge bushings, the lower strap section, latch component connections to straps, latch frames and springs. (Ref. 78-36-03, P. Block 601).
- on aft circumferential latch : inspect for excessive wear or poor condition of latch hook, receiver, hinge bushings, latch frame and spring. (Ref. 78-36-04, P. Block 601).
- on the bifurcation latch access doors : Inspect for excessive wear on latch hook, receiver, hinge bushings, latch frame and spring. (Ref. 78-36-04, P. Block 601).
- on toggle latch : inspect for good condition of toggle pin, receiver, hinge bushings, latch frame and two springs (Ref. 78-36-04, P. Block 601).

D. Close Thrust Reverser Door

NOTE : Closing procedures are identical for left and right doors.

(1)Check the integrity of the thrust reverser doors latches before closing them.

(2)Lubricate fan case and engine V-grooves, and thrust reverser door V-blades, with Material No.P04-001 (Ref. 71-13-03, P. Block 201).

NOTE : A film of lubricant should be evident on engine V-grooves and thrust reverser door V-blades at all times. V-grooves and V-blades are lubricated with grease, Material No.P04-001 at each engine or thrust reverser door change, and as required to prevent binding and facilitate door closing.

R WARNING : DO NOT HOLD THE THRUST REVERSER DOOR OPEN WITH THE DOOR OPENING ACTUATOR ALONE. FAILURE OF ACTUATOR CAN CAUSE SERIOUS INJURY OR DEATH.

R CAUTION : USE ONLY THE RSE1002 OR RSE1111 HAND OPERATED HYDRAULIC PUMP UNIT OR AUTHORIZED EQUIVALENT TO LIFT THE THRUST REVERSER COWL DOORS.

R (3)Connect RSE1002 or RSE1111 hand-operated hydraulic pump.

R (a)Verify that the manifold lockwire is there. The Eaton-Sterer identification seal must be there and lockwire intact (Ref. Fig. 304).

R (b)If the manifold lockwire is missing or altered, it is recommended that the manifold be removed and calibrated or replaced. Do this before you use the Hand-Operated Hydraulic Pump.
To remove and install the manifold, (Ref. 78-36-02, P. Block 401).
To recalibrate the manifold, refer to Vickers CMM 78-30-02, Door Opening - Manifold Assembly.

R (c)Connect the hand-operated hydraulic pump (RSE1002 or RSE1111) to the manifold quick-disconnect fitting (Ref. Fig. 304). The quick-disconnect fitting is aft of the center bifurcation latch. If required, service the pump with lubricating oil (Material No.P03-001).

R NOTE : For the RSE1002 or RSE1111 pump, the internal pressure relief requirement is between 3600 and 3800 psig (24800 and 26200 kPa) and the reseat pressure is between 3000 and 3400 psig (20700 and 23400 kPa).

R WARNING : PULL ON THE HYDRAULIC PUMP HOSE TO MAKE SURE THE HYDRAULIC PUMP HOSE IS CORRECTLY CONNECTED TO THE DOOR CONNECTOR. IF THE PUMP HOSE IS NOT CORRECTLY CONNECTED, THE DOOR ACTUATOR WILL NOT PRESSURIZE. THE DOOR CAN CLOSE SUDDENLY IF IT IS NOT HELD OPEN BY HOLD-OPEN RODS. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

R (4)Operate the hand-operated hydraulic pump to momentarily raise the thrust reverser door sufficiently to remove the weight of the door from the hold-open rods. On Post SB PW4NAC 71-99 hold-open rods, raise the door until both rods green band are visible in groove when looking directly at the thumb-lock latch trigger on the hold-open rod.

R WARNING : FOLLOW HOLD-OPEN ROD DISENGAGEMENT SEQUENCE FOR ADDED SAFETY. THE FORWARD HOLD-OPEN ROD MUST REMAIN ATTACHED TO THE ENGINE SUPPORT BRACKET IN THE FULL OPEN LOCKED POSITION DURING DISENGAGEMENT OF THE AFT HOLD-OPEN ROD FROM ENGINE SUPPORT BRACKET.

R WARNING : MAKE SURE YOU DO NOT DISENGAGE THE HOLD-OPEN ROD FROM THE FAN CASE UNTIL YOU REMOVE THE LOAD (WEIGHT OF THRUST REVERSER)

R ON THE HOLD-OPEN ROD. FOR POST SB PW4NAC 71-99 HOLD-OPEN RODS,
R THE LOAD IS REMOVED WHEN YOU CAN SEE THE GREEN BAND ON THE ROD
R WHEN LOOKING DIRECTLY AT THE THUMB LOCK LATCH TRIGGER. THIS
R WILL PREVENT INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.
R CAUTION : DO NOT USE TOO MUCH FORCE TO RELEASE THE LATCH. IF TOO MUCH
R FORCE IS USED, IT CAN CAUSE DAMAGE TO THE RELEASE LATCH AND
R MAKE THE HOLD-OPEN ROD UNSERVICEABLE. LIFT THE WEIGHT OFF THE
R HOLD-OPEN ROD IF YOU NEED TO USE TOO MUCH FORCE.
R CAUTION : THE V-BLADES ON THE THRUST REVERSER DOOR MUST FREELY
R ENGAGE THE V-GROOVES ON THE ENGINE. MAKE SURE ALL FAILURES AND
R DEFECTS ARE CORRECTED ON THE V-BLADES AND V-GROOVES. THIS
R WILL PREVENT DAMAGE TO THE EQUIPMENT.

R (5) Disengage the AFT hold-open rod from the support bracket. Pull back on the knurled release collar at the end of the rod. At the same time, push the thumb-lock latch. Retract the rod to the stowed position in the locked groove.

R (6) Stow the AFT hold-open rod into the retention bracket on the inside of the thrust reverser door.

R (7) Disengage the FORWARD hold-open rod from the support bracket. Pull back on the knurled release collar at the end of the rod. At the same time, push the thumb-lock latch. Retract the rod to the stowed position in the locked groove.

R (8) Stow the FORWARD hold-open rod into the retention bracket on the inside of the thrust reverser door.

R (9) Slowly release pressure from RSE1002 or RSE1111 Hand-Operated Hydraulic Pump to lower the thrust reverser door until the door is fully closed.

R CAUTION : MAKE SURE YOU LET THE FLUID DRAIN FOR SIXTY (60) SECONDS
R BEFORE YOU REMOVE THE HAND-OPERATED HYDRAULIC PUMP HOSE.
R PRESSURE BUILD-UP IN A CLOSED SYSTEM CAN CAUSE DAMAGE TO
R EQUIPMENT.
R CAUTION : DAMAGE TO THRUST REVERSER DOOR COULD RESULT IF HYDRAULIC
R POWER UNIT IS DISCONNECTED BEFORE DOOR IS WITHIN SIX INCHES
R (152 MM) OF FULL CLOSED POSITION.
R IT IS ESSENTIAL FOR ENGINE PERFORMANCE THAT INTEGRITY OF AFT
R COWL LOAD SHARING MECHANISM (AFT CIRCUMFERENTIAL DOOR LATCH
R TOGGLES AND RECEIVERS) BE MAINTAINED AT ALL TIMES.

R (10) Disconnect the hand-operated hydraulic pump from the quick disconnect fitting.

R (11) Engage and lock thrust reverser door latches as follows.

(a) Release quick disconnect clamp attaching door closure assist device rod to left thrust reverser door.
(Ref. Fig. 305)

(b) Adjust both threaded ends of closure assist device until equal lengths of threads are exposed on each side of barrel.

(c) Move hinged rod across opening between doors and attach rod to hook on right hand thrust reverser.

NOTE : If adjustment of closure assist device is required to engage hook, firmly hold free end and turn barrel of rod only.

(d) Rotate barrel of rod to reduce opening between doors and to facilitate engagement of center tension latch at lower bifurcation area.

(e) Engage and lock forward and aft tension latches at lower bifurcation

area.

(f)Remove door closure assist device, stow and secure rod in quick-disconnect clamp on left hand thrust reverser door.

R (12)Close and secure latch access doors at lower center bifurcation area of thrust reverser doors.

R (13)Engage and lock front circumferential latches, left and right.

CAUTION : SIXTY (60) SECOND DELAY MUST BE OBSERVED BEFORE DISCONNECTING HYDRAULIC PUMP FROM DOOR TO ALLOW ACTUATOR AND MANIFOLD TO DRAIN SURPLUS OIL. THIS MINIMIZES POTENTIAL FOR PRESSURE BUILDUP IN CLOSED SYSTEM DUE TO THERMAL EXPANSION.

R (14)Disconnect hydraulic pump from door.

CAUTION : DO NOT USE EXCESSIVE FORCE TO CLOSE HANDLE AS THIS COULD BEND OR BREAK THE GUIDE PINS. TOOLS OR OTHER ASSISTING DEVICES SHOULD NEVER BE USED.

R (15)Engage and lock lower aft circumferential door latch using hand pressure only.

NOTE : Make sure that latch closing force is between 70 and 80 lbs (31.14 and 35.58 daN). If closing force for any latch is outside of specified range, adjust the latches (Ref. 71-13-03, P. Block 501).

CAUTION : IT IS IMPORTANT TO VERIFY THAT THE TOGGLE PIN IS MATING PROPERLY WITH THE AFT TENSION STRAP RECEPTACLE BEFORE MANUALLY CLOSING THE TOGGLE LATCH. FAILURE TO DO SO COULD RESULT IN DIFFICULTY TO CLOSE THE LATCH HANDLE. THE USE OF EXCESSIVE FORCE TO CLOSE THE LATCH WILL RESULT IN BENT GUIDE PINS AND GALLED TOGGLE PIN. TOGGLE LATCHES SHOULD BE CLOSED USING HAND PRESSURE ONLY. A STRONG SNAP SHOULD BE FELT INDICATING PROPER CLOSING OF TOGGLE LATCH. IF LATCH IS EXCESSIVELY LOOSE, DIFFICULT TO CLOSE, OR EXHIBITS ANY DAMAGE, THE TOGGLE LATCH SHOULD BE INSPECTED (REF. 78-36-04, P. BLOCK 601).

R (16)Close aft load sharing toggle latch using hand pressure only. (Ref. Fig. 306)

NOTE : Toggle latch closing for the second latch should be between 10 and 50 lbs. (4.45 and 22.24 daN). If closing force for any latch closing of specified range, adjust that latch and recheck the other aft latch until proper closing force is obtained (Ref. 71-13-03, P. Block 501).

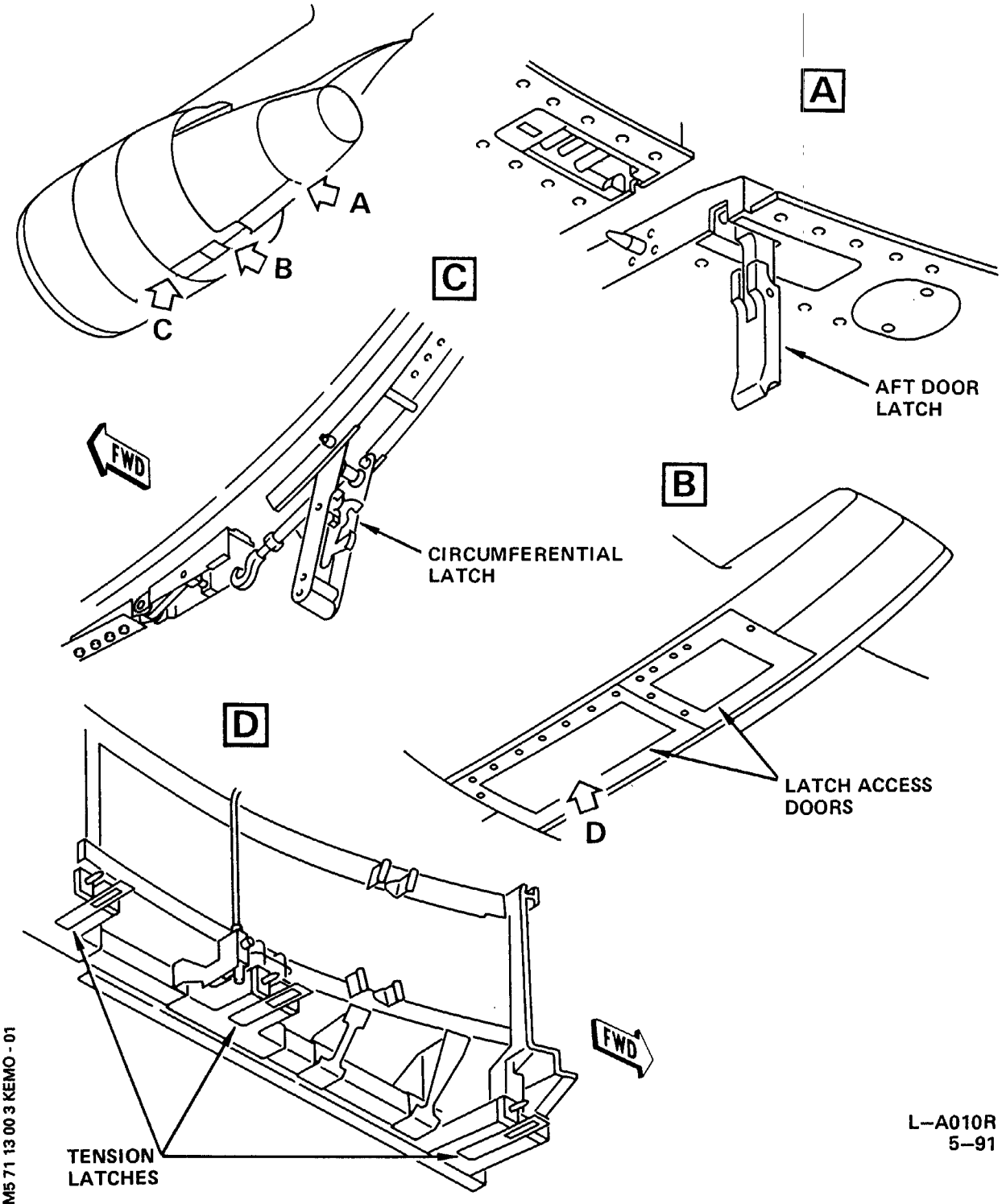
R (17)Close fan cowl doors. See Paragraph 3.B.

5. Close-Up

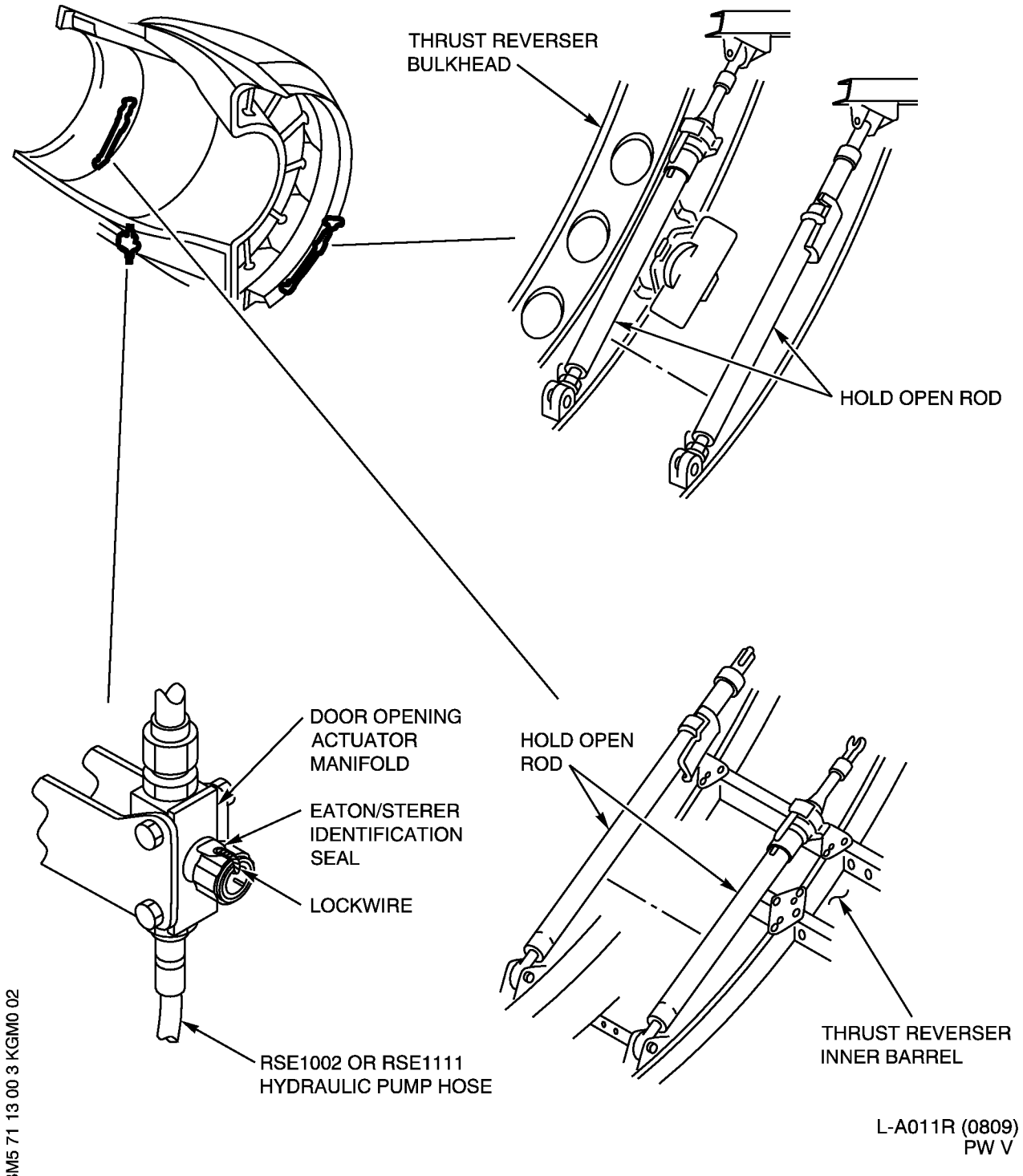
A. Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

B. Remove safety clips and tags and close circuit breakers 1KG, 1JH, 2JH, 8JH, 1KM, 2KM, 3KC and 4KC.

C. Make sure that circuit breakers 1KU and 2KU are open, safetied and tagged.

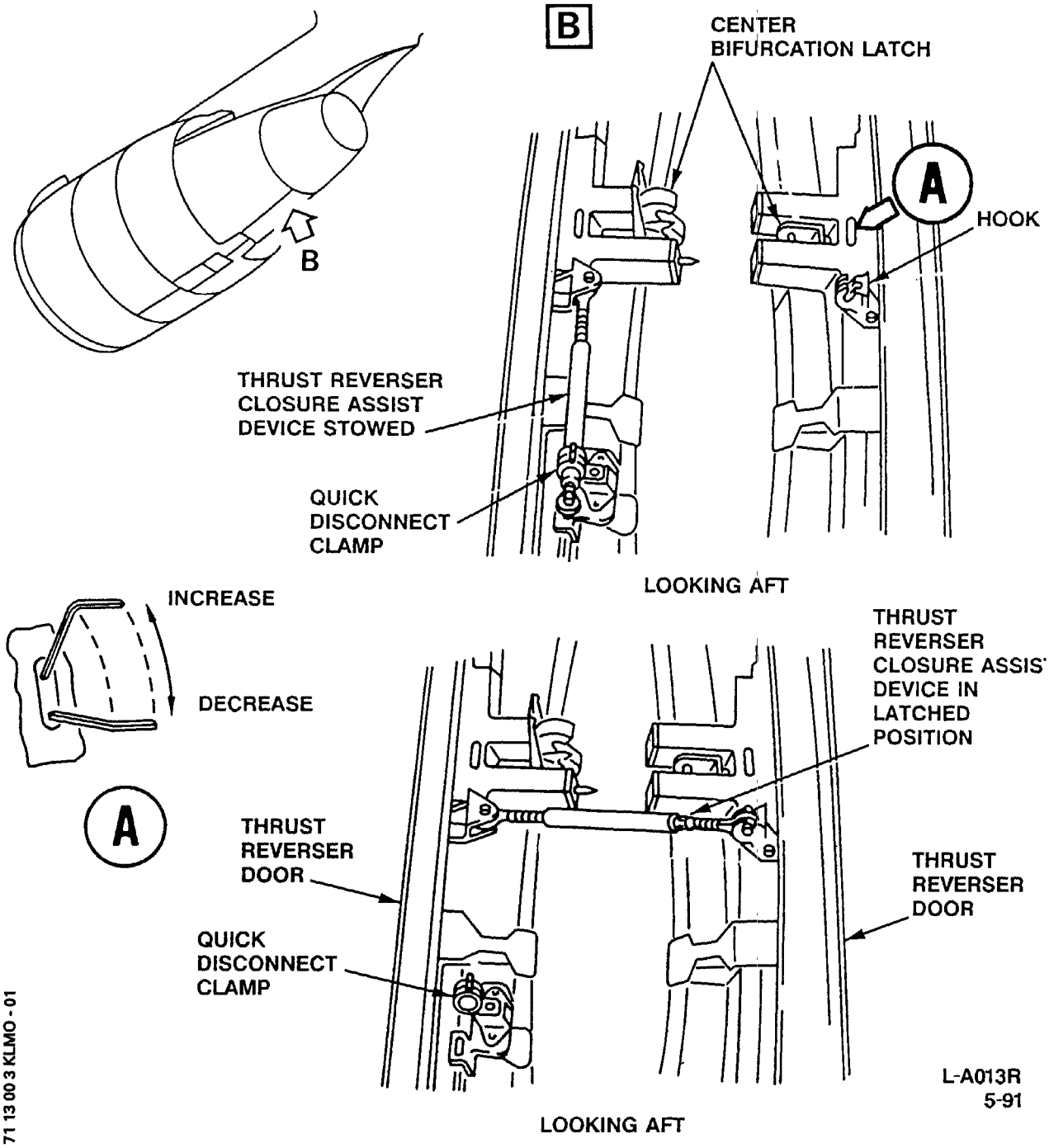


Thrust Reverser Door Latches
Figure 303

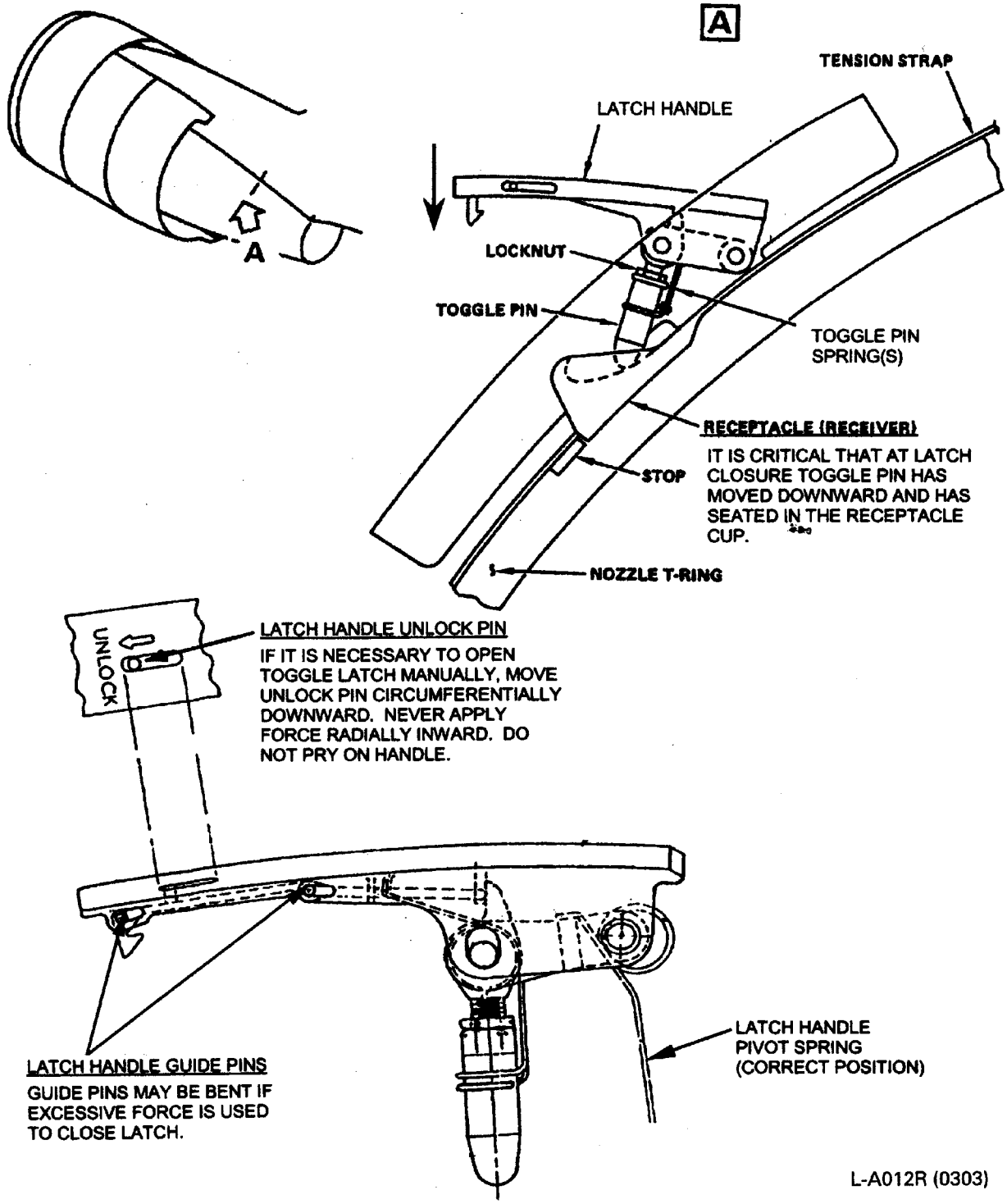


Thrust Reverser Door Hold Open Rods and Actuator Manifold
Figure 304

R



Thrust Reverser Door Closure Assist Device
Figure 305


A
TENSION STRAP
LATCH HANDLE
LOCKNUT
TOGGLE PIN
TOGGLE PIN SPRING(S)
RECEPTACLE (RECEIVER)
IT IS CRITICAL THAT AT LATCH CLOSURE TOGGLE PIN HAS MOVED DOWNWARD AND HAS SEATED IN THE RECEPTACLE CUP.
STOP
NOZZLE T-RING
UNLOCK
LATCH HANDLE UNLOCK PIN
IF IT IS NECESSARY TO OPEN TOGGLE LATCH MANUALLY, MOVE UNLOCK PIN CIRCUMFERENTIALLY DOWNWARD. NEVER APPLY FORCE RADIALLY INWARD. DO NOT PRY ON HANDLE.
LATCH HANDLE GUIDE PINS
GUIDE PINS MAY BE BENT IF EXCESSIVE FORCE IS USED TO CLOSE LATCH.
LATCH HANDLE PIVOT SPRING (CORRECT POSITION)
L-A012R (0303)

BM5 71 13 00 3 KPM0 00

Aft Cowl Load Sharing Toggle Latches
Figure 306

1. Equipment and Materials

ITEM	DESIGNATION
A. RSE1004	Sling - Fan Cowl Doors
B. RSE1106	Dolly - Fan Cowl Doors
C. Material No.P03-001	Oils (Ref. 70-00-00)
D.	Circuit Breaker Safety Clips
E.	Torque Wrench
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-02, P. Block 501	Fan Cowl
- 71-13-05, P. Block 501	Fan Cowl Door Latch

2. Procedure

CAUTION : DO NOT OPEN FAN COWL DOORS IF GROUND WIND VELOCITIES EXCEED 40 KNOTS. DO NOT LEAVE DOORS OPEN IF GROUND WIND VELOCITIES EXCEED 60 KNOTS. WINDS IN EXCESS OF THESE VELOCITIES WILL CAUSE OVERSTRESS AND POSSIBLE FAILURE OF DOORS, OPENING AND HOLD-OPEN DEVICES, OR ASSOCIATED HARDWARE.

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan cowl door (Ref. 71-13-00, P. Block 301).

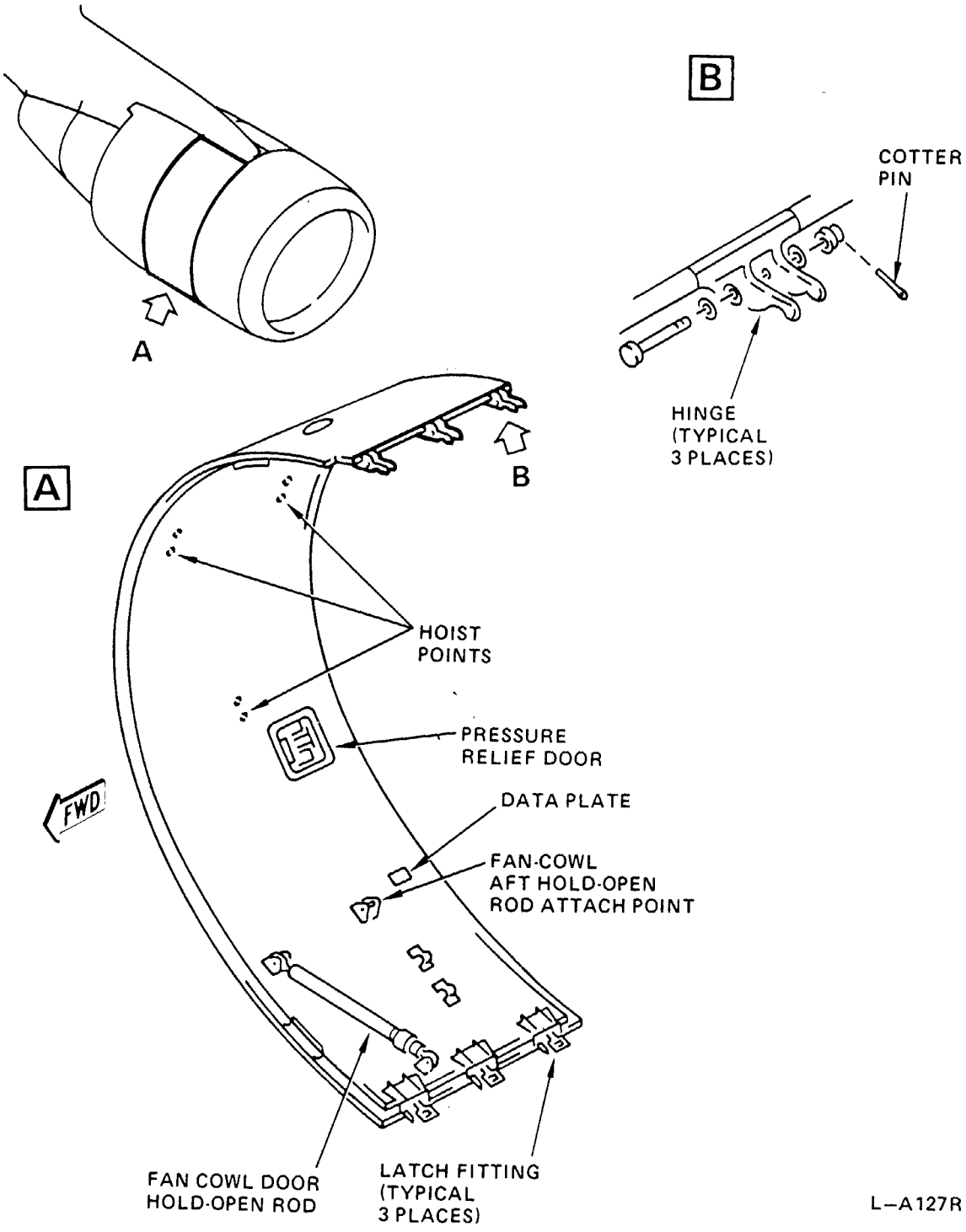
B. Removal (Ref. Fig. 401, 402, 403)
(Ref. Fig. 404)
(1)Remove hoist point plugs and retain for installation. (Ref. Fig. 401)
(2)Install RSE1004 Fan Cowl Sling attach pads to fan cowl hoist points. (Ref. Fig. 403)
(3)Position hoist over fan cowl door and attach sling to hoist.
(4)Unlatch fan cowl door latches by pressing latch trigger to release latch handle and pull down to release tension latch.
(5)With hoist, open door sufficiently for access to remove door hinge pins. Do not exceed 60 degrees.
(6)Remove cotter pin, nut, washers and hinge pin from forward pylon hinge. (Ref. Fig. 402)
(7)Remove cotter pin, nut, washers and hinge pin from center pylon hinge.
(8)Remove cotter pin, nut, washers and hinge pin from aft pylon hinge.
(9)Carefully move fan cowl door clear of pylon and position on RSE1106 fan cowl dolly.
(10)Disconnect sling from hoist.
(11)Secure fan cowl door on dolly.
(12)Remove attach pads from fan cowl door and replace hoist point plugs.

C. Installation (Ref. Fig. 401, 402, 403)
(Ref. Fig. 404)
CAUTION : MAKE SURE THE FAN COWL DOORS YOU PLAN TO INSTALL

ARE THE CORRECT CONFIGURATION FOR THE ENGINE, OR DAMAGE TO THE FAN COWL DOORS OR THE ENGINE CAN OCCUR.

(1) Remove hoist attach point plugs and install RSE1004 Fan Cowl Sling attach pads to fan cowl door. (Ref. Fig. 401, 403)
(2) Position hoist over fan cowl door and attach sling to hoist.
(3) Remove fan cowl dolly straps.
(4) With hoist, carefully lift fan cowl door to vertical position clear of dolly.
(5) Move fan cowl door in position to align fan cowl hinge sections with pylon hinge sections.
NOTE : Hinge pins are installed with heads on forward side of hinge.
(6) Lubricate threads of forward hinge pin with Material P03-001. Install forward hinge pin, washers and nut. TORQUE nut to between 100 and 140 lbf.in. (1.13 and 1.58 m.daN) and install cotter pin.
(7) Lubricate threads of center hinge pin with Material No.P03-001. Install center hinge pin, washers and nut. TORQUE nut to between 100 and 140 lbf.in. (1.13 and 1.58 m.daN) and install cotter pin.
(8) Lubricate threads of aft hinge pin with Material P03-001. Install aft hinge pin, washers and nut. TORQUE nut to between 100 and 140 lbf.in. (1.13 and 1.58 m.daN) and install cotter pin.
(9) With hoist, lower fan cowl door until sling straps are slack and disconnect sling from hoist.
(10) Remove attach pads from fan cowl hoist points and install hoist point plugs.
(11) Adjust fan cowl door position (Ref. 71-13-02, P. Block 501).
(12) Check adjustment of fan cowl door latches (Ref. 71-13-05, P. Block 501).

D. Close-Up
(1) Close fan cowl doors (Ref. 71-13-00, P. Block 301).
(2) Remove safety clips and tags and close circuit breakers.



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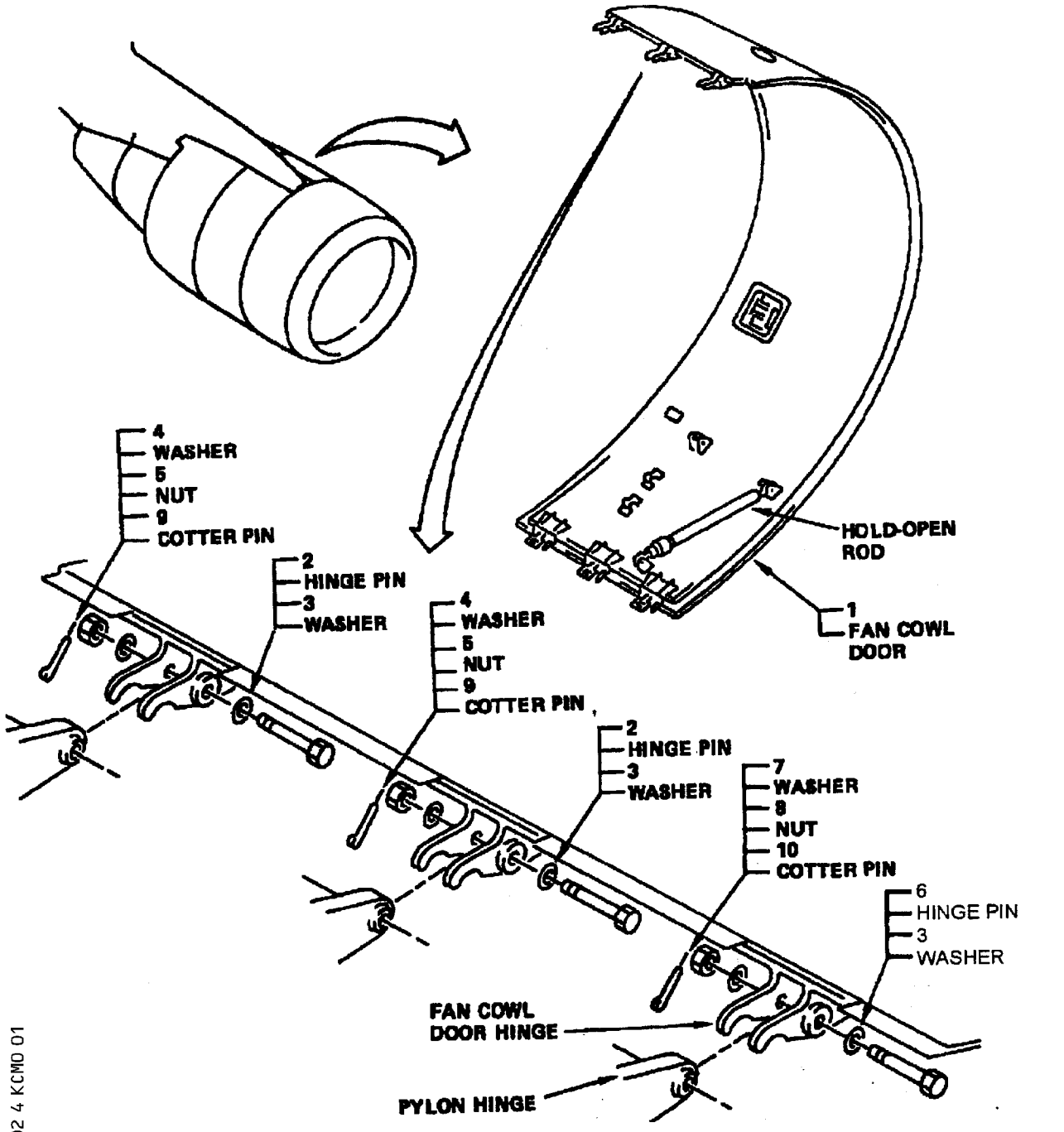
DM5

Fan Cowl Door - Details
Figure 401



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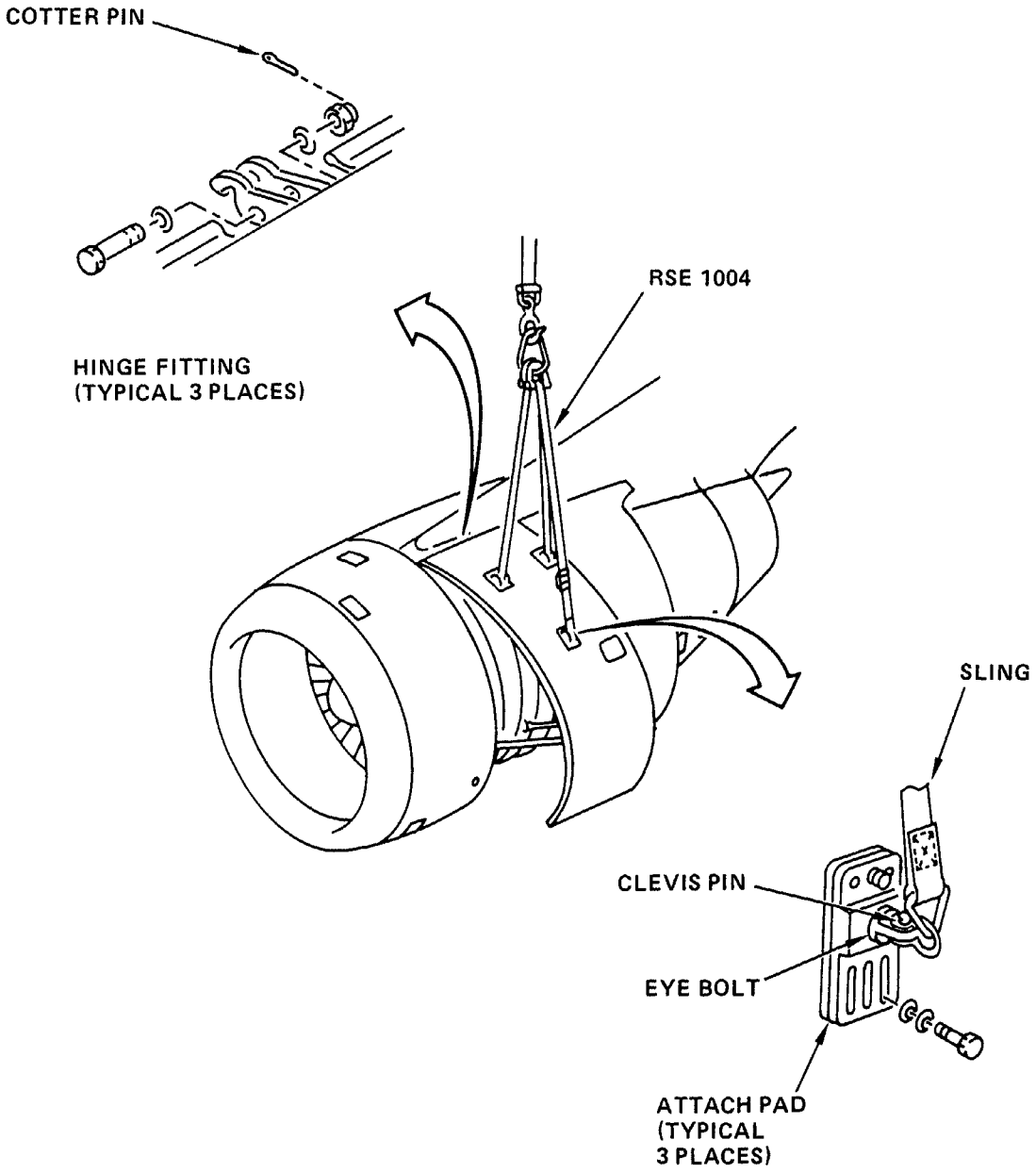
Fan Cowl Door
Figure 402

R



BM5 71 13 02 4 KEMO - 01/30 - 01/25
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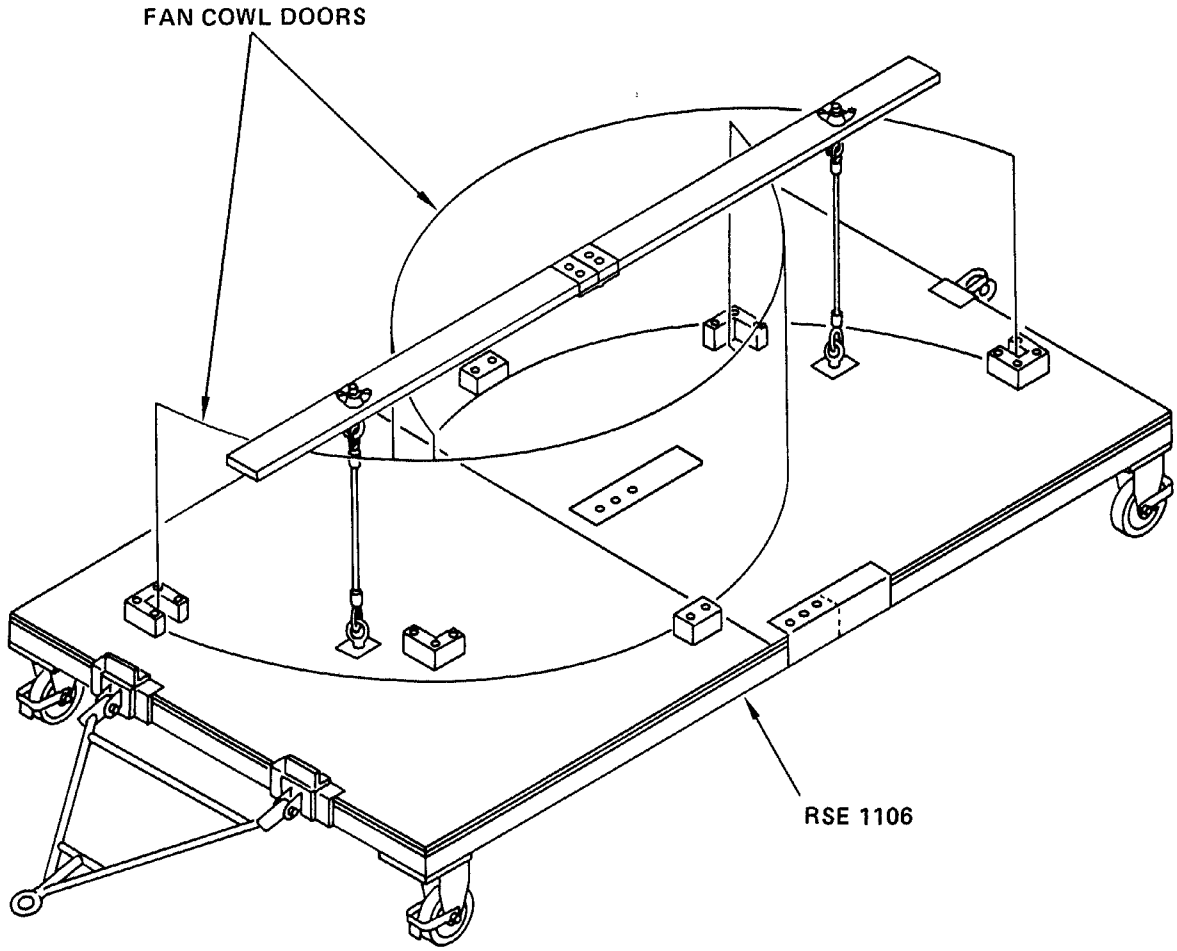
L-A129R
4-89

Fan Cowl Door - Removal Sling
Figure 403



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L–A130R
4–89

Fan Cowl Door - Handling Dolly
Figure 404

FAN COWL - ADJUSTMENT/TEST

NOTE : Check latch tension any time a fan cowl, inlet cowl, or thrust reverser cowl is changed.

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Access Platform
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl
- 71-13-05, P. Block 501	Fan Cowl Door Latch

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG2/REVERSE/CTL	2KM	331/V74
133VU	ENGINES/ENG1/REVERSE/CTL	1KM	332/U69
133VU	ENGINES/ENG2/IGNITION/SYS A	8JH	333/T71
133VU	ENGINES/ENG1 & 2/IGNITION/SYS B	2JH	333/T72
133VU	ENGINES/ENG1/IGNITION/SYS A	1JH	334/S72
133VU	ENGINES/ENG1 & 2/START/CTL & WARN	1KG	335/R68

(2)Install access platform

B. Adjustment (Ref. Fig. 501, 502)
(1)Verify the thrust reverser doors are properly adjusted (Ref. 71-13-03, P. Block 501).
(2)Adjust the gap between the fan cowl door, translating sleeve and the inlet cowl. With fan cowl doors closed, determine adjustment necessary to obtain the following dimensions :
(Ref. Fig. 501)
(a)Allowable step between the fan cowl and the inlet cowl is as follows :
1 0.045 in. (1.143 mm) is average for positive or negative step determined as follows :
a Measure the step every 18 in. (450 mm) along the joint. Do not assign positive or negative values to the measurements.
b Add all the measurements together and divide by the total number of measurements taken.
c Average the forward and aft joints separately.
2 +0.120 in. (3.048 mm) or -0.120 in. (3.048 mm) is the maximum mismatch for positive or negative step.
(b)Allowable step between the fan cowl and the translating sleeve is as follows :
1 0.045 in. (1.143 mm) is average for positive or negative step

determined as follows :
a Measure the step every 18 in. (450 mm) along the joint. Do not assign positive or negative values to the measurements.
b Add all the measurements together and divide by the total number of measurements taken.
c Average the forward and aft joints separately.
2 +0.090 in. (2.286 mm) or -0.150 in. (3.048 mm) is the maximum mismatch for positive or negative step.

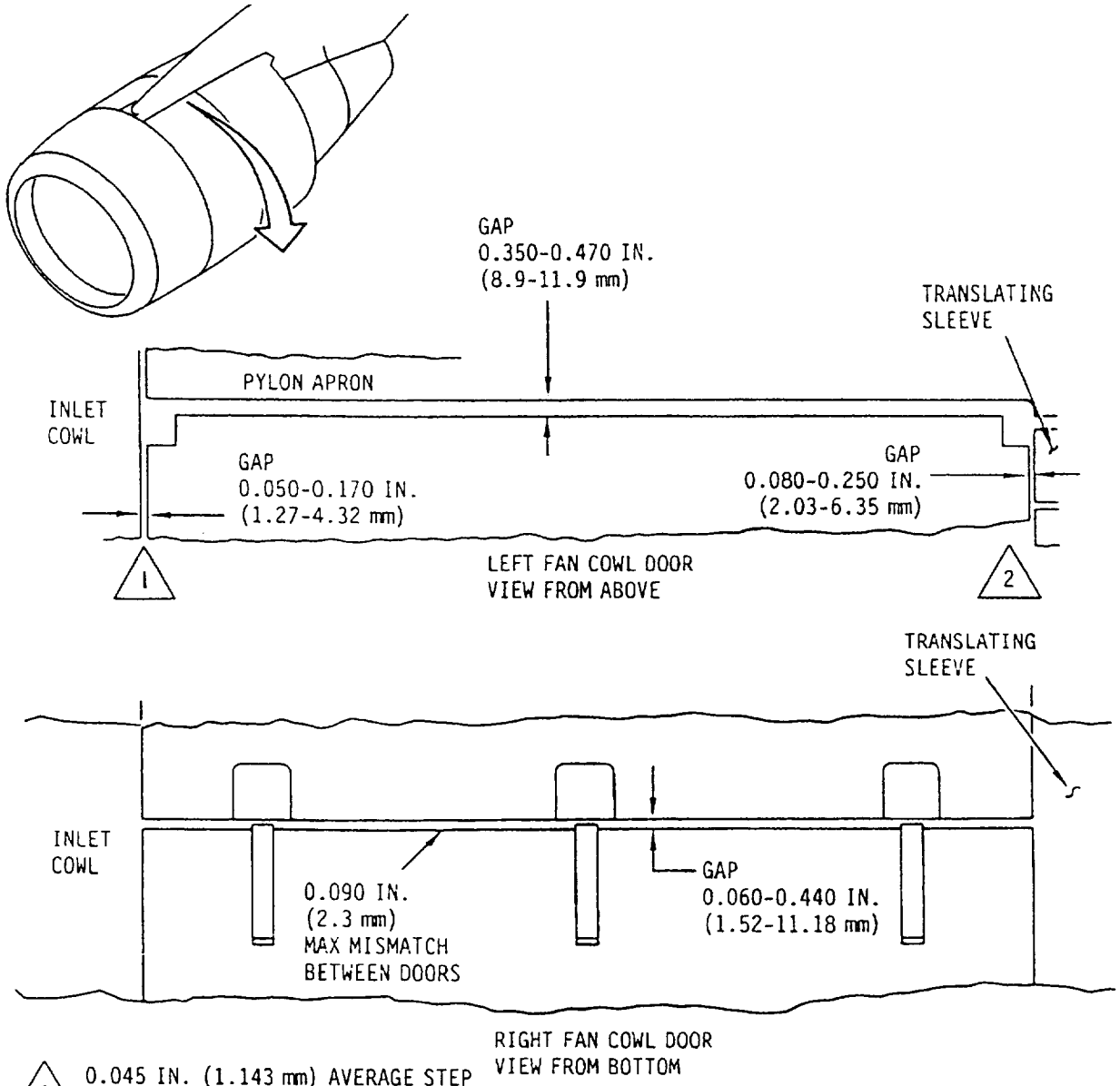
(3)Adjust cowl mismatch by adjusting fan cowl door latches (Ref. 71-13-05, P. Block 501).
(a)The maximum mismatch between the left and right hand doors is 0.090 in. (2.286 mm).
(b)The allowable gaps between the fan cowl and adjacent structures are as follows :
(Ref. Fig. 501)
1 Fan cowl to inlet cowl is 0.050 - 0.170 in. (1.27 - 4.32 mm).
2 Fan cowl to translating sleeve is 0.080 - 0.250 in. (2.03 - 6.35 mm).
3 Left to right fan cowl door is 0.060 - 0.440 in. (1.52 - 11.18 mm).
4 Left fan cowl door to pylon is 0.350 - 0.470 in. (8.9 - 11.9 mm).
(c)Open the fan cowl doors, loosen the screws in the bumper segments on the left fan cowl door and adjust as needed.
(d)TORQUE the screws attaching the bumper segments to between 45 and 50 lbf.in. (0.51 and 0.56 m.daN).
(e)Close the fan cowl doors (Ref. 71-13-00, P. Block 301).
(f)Verify allowable edge margins and gap.

(4)Adjust fan cowl doors (Ref. Fig. 502).
(a)Open the fan cowl door (Ref. 71-13-00, P. Block 301).
(b)Loosen the bolts that attach the locator alignment fitting and the alignment plate.
(c)Close and latch the fan cowl door. Adjust the alignment fitting to maintain a 0.220 to 0.260 in. (5.588 to 6.604 mm) gap between the alignment fitting and the alignment plate.
(d)Do the procedure again on the opposite fan cowl door.
(e)TORQUE the nuts attaching the left and right alignment fittings to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(5)Adjust alignment plate (Ref. Fig. 502).
R (a)Open both fan cowl doors.
R NOTE : Verify that the forward and aft length of the slot in the alignment plate is no greater than 0.670 in. (17.018 mm) ((Ref. Fig. 502) for dimension to be measured). See Service Bulletin PW4NAC 71-169 for replacement part information.
R (b)Initial Gap Rigging : Slowly close one fan cowl door to engage fan cowl alignment pin in the inlet alignment plate and hold the fan cowl in this position. Make sure the alignment pin is centered in the alignment plate slot. Adjust the alignment plate as necessary. Repeat step for the opposite fan cowl door.
R (c)Place clay (or equivalent) with thickness approximately 0.7 in. (17.780 mm) on the LH and RH fan cowl alignment pin fitting. Close and latch the fan cowl doors.
R (d)Make sure the gap between the fan cowl and translating sleeve to be 0.080 to 0.250 in. (2.0 to 6.4 mm) and the gap between the fan cowl and

R inlet to be 0.050 to 0.170 in. (1.3 to 4.3 mm). Adjust the alignment
R plate as necessary in the station direction once the fan cowl doors are
R opened (contact of the pin to the plate in the station direction is
R permitted if required).
R (e)Open the fan cowl doors and make sure that the LH and RH gap between
R the fan cowl alignment pin fitting and the fan cowl alignment plate is
R 0.220 to 0.260 in. (5.59 to 6.60 mm). Adjust the gap as necessary.
R (f)If any adjustments were made in steps b, c, or d then repeat steps b
R through d to confirm gaps.
R (g)Torque the four alignment fitting bolts and the four alignment plate
R bolts on the LH and RH.

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Remove safety clips and tags, and close circuit breakers 1JH, 2JH, 8JH, 1KG, 1KM and 2KM.



1 0.045 IN. (1.143 mm) AVERAGE STEP
0.120 IN. (3.0 mm) MAXIMUM STEP
-0.120 IN. (-3.0 mm) MINIMUM STEP

2 0.045 IN. (1.143 mm) AVERAGE STEP
0.090 IN. (2.285 mm) MAXIMUM STEP
-0.150 IN. (-3.81 mm) MINIMUM STEP

L-A044T(0798)

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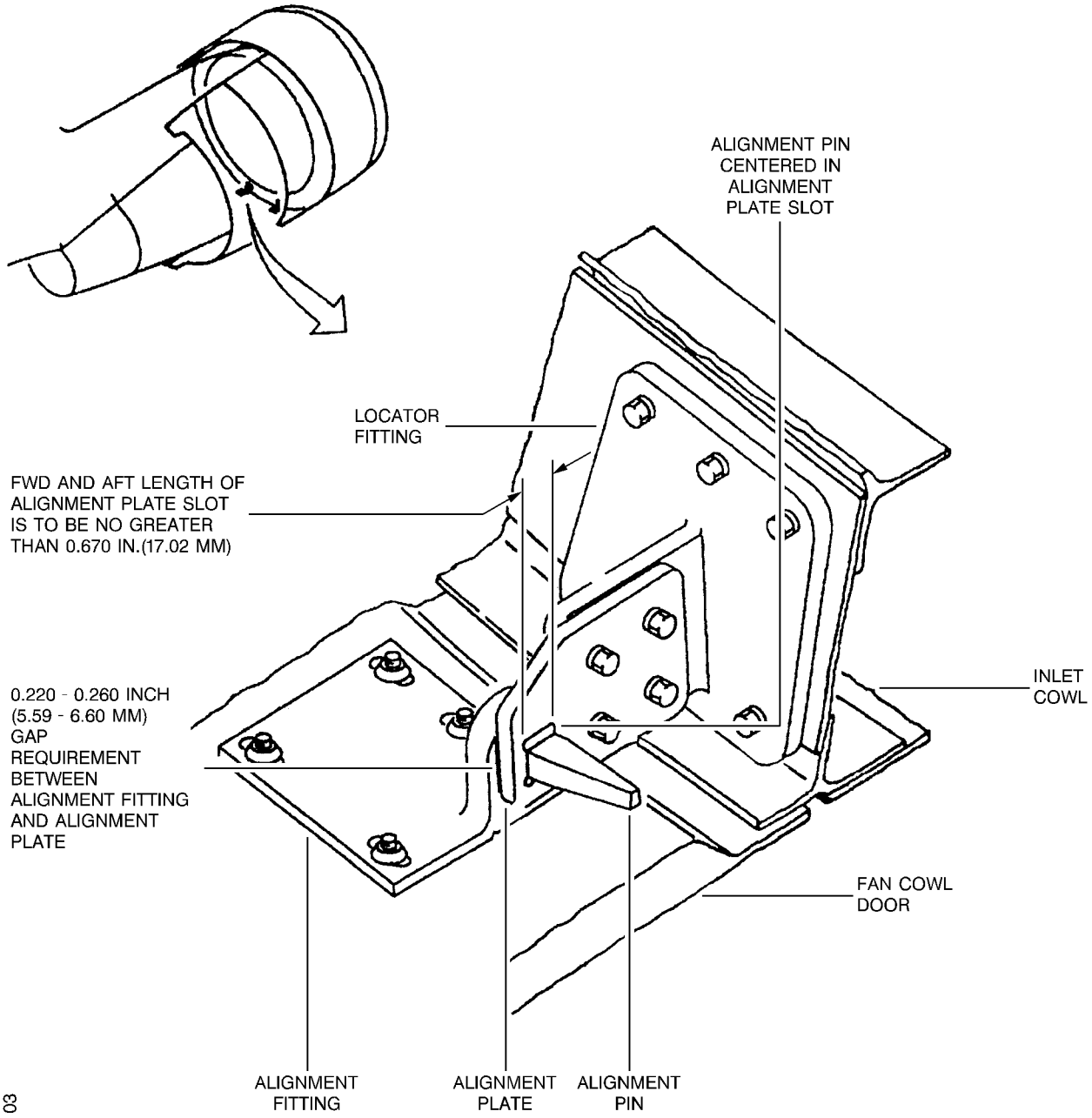
Fan Cowl Door Adjustments
Figure 501


ALIGNMENT PIN CENTERED IN ALIGNMENT PLATE SLOT
LOCATOR FITTING
FWD AND AFT LENGTH OF ALIGNMENT PLATE SLOT IS TO BE NO GREATER THAN 0.670 IN.(17.02 MM)
0.220 - 0.260 INCH (5.59 - 6.60 MM) GAP REQUIREMENT BETWEEN ALIGNMENT FITTING AND ALIGNMENT PLATE
INLET COWL
FAN COWL DOOR
ALIGNMENT FITTING
ALIGNMENT PLATE
ALIGNMENT PIN
L-A042T (0304)

BM5 71 13 02 5 KCM0 03

R

Fan Cowl Door Margin Adjustment
Figure 502

FAN COWL - INSPECTION/CHECK

1. Damage Limits
   For damage limits, refer to 71-00-00, P. Block 601.

2. Inspect Fan Cowl Door Locator Fittings

   A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Torque Wrench
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

   B. Job Set-Up
      (1)Open, safety and tag the appropriate circuit breakers and open fan cowl doors.

   C. Procedure (Ref. Fig. 601)
R   (1)Open both fan cowl doors.
R   NOTE : Verify that the forward and aft length of the slot in the
R   alignment plate is no greater than 0.670 in. (17.018 mm)
R   ((Ref. Fig. 601) for dimension to be measured). See Service
R   Bulletin PW4NAC 71-169 for replacement part information.
         CAUTION : SLOWLY LOWER FAN COWL DOOR TO CLOSED POSITION. ALIGNMENT OF
                   FAN COWL DOOR LOCATOR TO INLET COWL BRACKET IS IMPERATIVE.
                   FAILURE TO ENSURE PROPER ALIGNMENT MAY RESULT IN DAMAGE TO OR
                   BREAKAGE OF LOCATOR FUSE DESIGN.
R   (2)Initial Gap Rigging : Slowly close one fan cowl door to engage fan cowl
R   alignment pin in the inlet alignment plate and hold the fan cowl in this
R   position. Make sure the alignment pin is centered in the alignment plate
R   slot. Repeat check for the opposite fan cowl door.
R   (3)Place clay (or equivalent) with thickness approximately 0.7 in.
R   (17.780 mm) on the LH and RH fan cowl alignment pin fitting. Close and
R   latch the fan cowl doors.
R   (4)Make sure gap between the fan cowl and translating sleeve to be 0.080 to
R   0.250 in. (2.0 to 6.4 mm) and the gap between the fan cowl and inlet to
R   be 0.050 to 0.170 in. (1.3 to 4.3 mm).
R   (5)Open the fan cowl doors and make sure that the LH and RH gap between the
R   fan cowl alignment pin fitting and the fan cowl alignment plate is
R   0.220 to 0.260 in. (5.59 to 6.60 mm). Adjust the gap as necessary.
R   (6)If any adjustments are required, (Ref. 71-13-02, P. Block 501) to confirm
R   gaps.
R   (7)Torque the four alignment fitting bolts and the four alignment plate
R   bolts on the LH and RH.

   D. Close-Up
      (1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

R 3. Inspection of Fan Cowl Hinge and Latch Assemblies for Corrosion

R A. General
R (1)This procedure provides instructions to inspect the hinge and tension latch assemblies of the fan cowl for corrosion.
R (2)The accomplishment of this procedure requires opening of the fan cowl doors. See 71-13-00, P. Block 301 for opening and closing procedures.

R B. Equipment and Materials

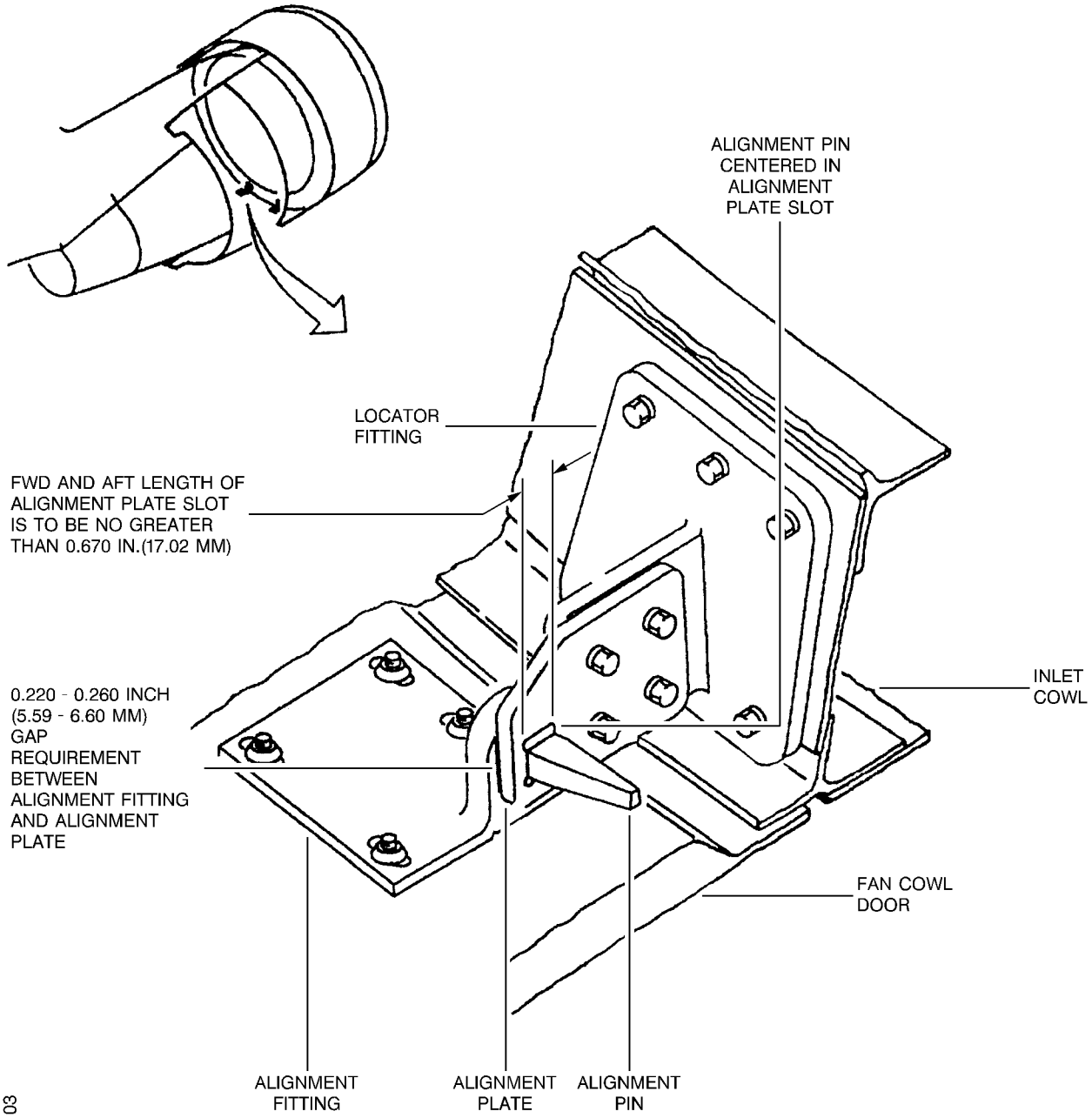
ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

R C. Procedure
R (1)Job Set-Up
R (a)Open, safety and tag the appropriate circuit breakers and open applicable fan cowl door (Ref. 71-13-00, P. Block 301).
R (2)Examine the hinge assemblies (3 places) and tension latch assemblies (3 places) on the left fan cowl for corrosion (Ref. Fig. 602). Refer to SRM to identify corrosion.
R NOTE : It is not necessary to disassemble the parts for this inspection.
R (3)Remove corrosion if found. Refer to SRM.
R (4)Examine the hinge assemblies (3 places) and tension latch assemblies (3 places) on the right fan cowl for corrosion (Ref. Fig. 602). Refer to SRM to identify corrosion.
R NOTE : It is not necessary to disassemble the parts for this inspection.
R (5)Remove corrosion if found. Refer to SRM.
R (6)Close-Up
R (a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
R (b)Remove safety clips and tags and close circuit breakers. Close fan cowl doors (Ref. 71-13-00, P. Block 301).

R 4. General Visual Inspection of Fan Cowl Door Assembly and Air Intake

R A. General
R (1)This procedure provides instructions to do a general visual inspection of the fan cowl door assembly and air intake.

R B. Equipment and Materials


ALIGNMENT PIN CENTERED IN ALIGNMENT PLATE SLOT
LOCATOR FITTING
FWD AND AFT LENGTH OF ALIGNMENT PLATE SLOT IS TO BE NO GREATER THAN 0.670 IN.(17.02 MM)
0.220 - 0.260 INCH (5.59 - 6.60 MM) GAP REQUIREMENT BETWEEN ALIGNMENT FITTING AND ALIGNMENT PLATE
INLET COWL
FAN COWL DOOR
ALIGNMENT FITTING
ALIGNMENT PLATE
ALIGNMENT PIN
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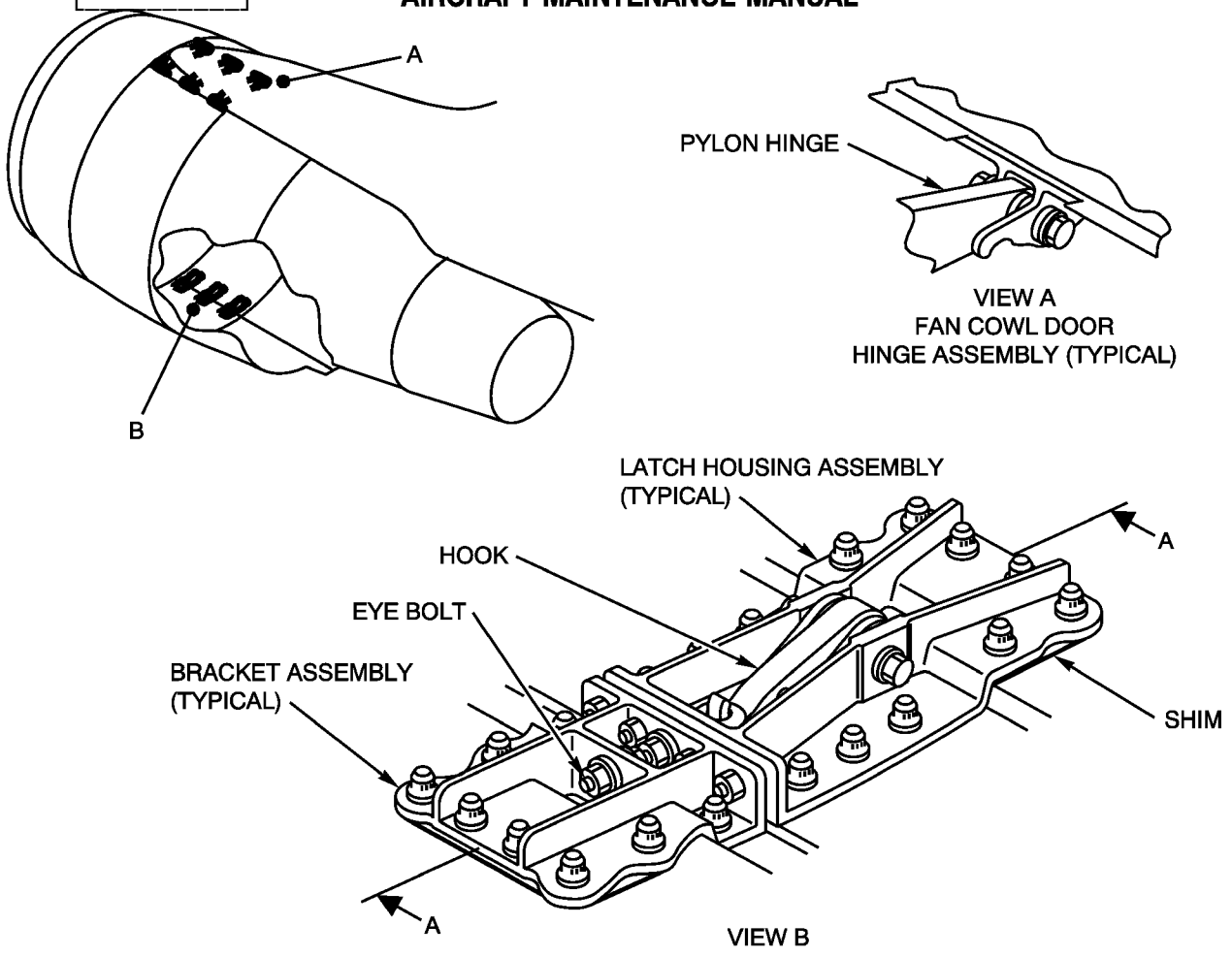
Fan Cowl Door Locator Fittings
Figure 601

R



Fan Cowl Hinge and Latch Assemblies
Figure 602

R

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Access Platform, 8 ft. (2.5 m)
(3)	White Light Source
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

C. Procedure

CAUTION : MAKE SURE THAT THE ENGINE 1, (2) SHUT DOWN OCCURRED NOT LESS THAN 5 MINUTES BEFORE YOU DO THIS PROCEDURE.

(1)Job set-up
  (a)Open, safety and tag the appropriate circuit breakers and open applicable fan cowl door (Ref. 71-13-00, P. Block 301).
  (b)Install an adjustable access platform as necessary.
(2)With a white light, do a visual inspection of the fan cowl door assembly and air intake.
  (a)Do a visual examination of the interior and/or exterior of the fan cowl door assembly and air intake up to the fan case attachment to any detect obvious damage, failure or irregularity.
(3)Close-up
  (a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
  (b)Remove safety clips and tags and close circuit breakers.
  (c)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
  (d)Remove access platform.

FAN THRUST REVERSER COWL - MAINTENANCE PRACTICES

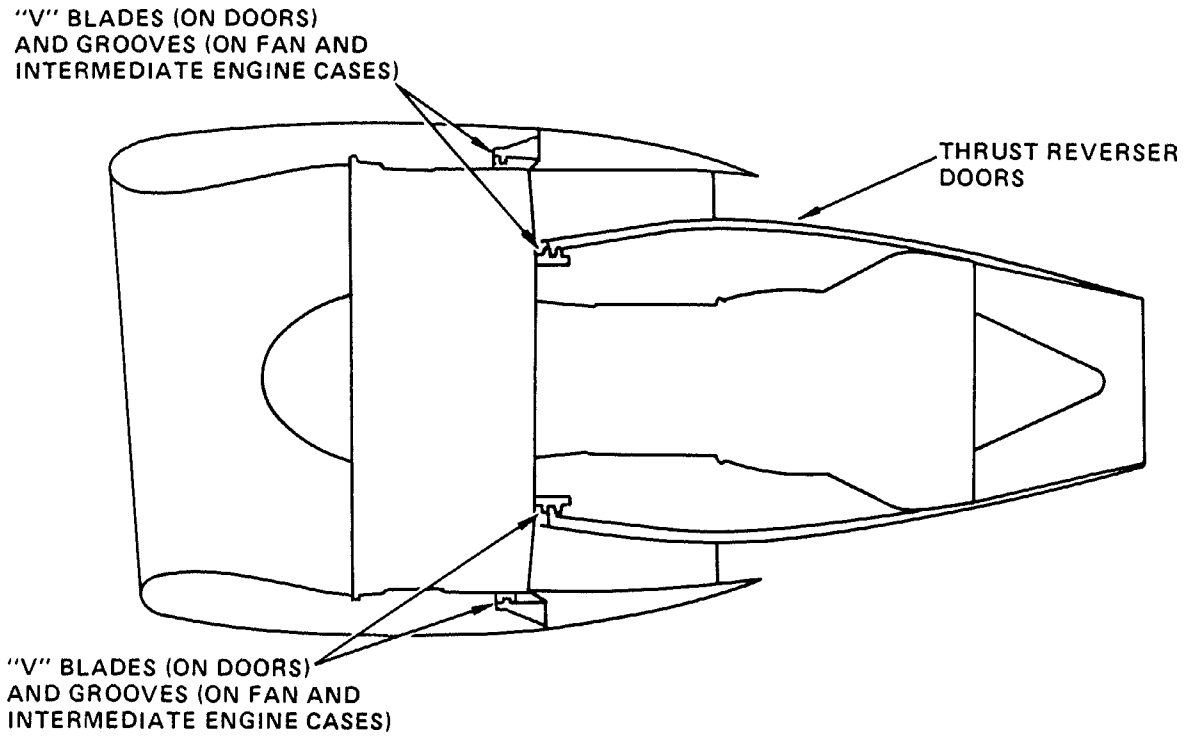
1. Equipment and Materials

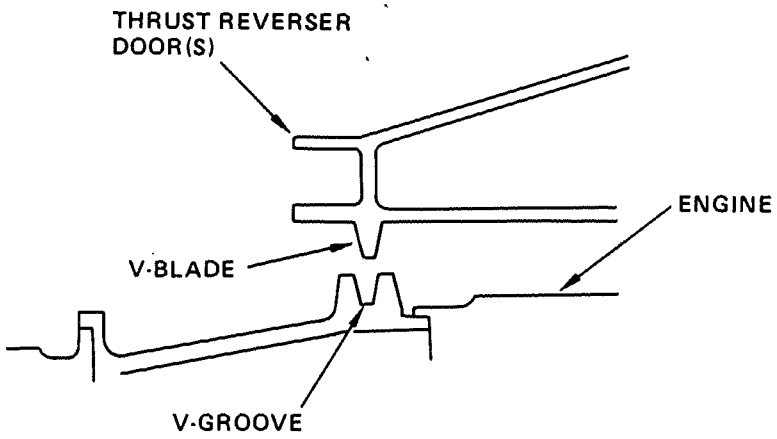
ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
R B.	Push-Pull Gage (Model LG-100 or Equivalent)
C.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
D. Material No.P04-001	Common Greases (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl

2. Lubricate Door V-Blades and Engine V-Grooves

A. General
This procedure provides instructions for lubricating thrust reverser door V-blades, and fan case and engine V-grooves. Lubrication is required following any engine or thrust reverser door change, and is performed as necessary whenever thrust reverser doors are open to prevent blades binding in grooves.

B. Procedure (Ref. Fig. 201)
(1)Inspect Mating Surfaces
(a)Inspect both V-blades on forward portion of each thrust reverser door. Look for a clean, thin coating of grease covering the entire length and depth of each blade.
(b)Inspect V-grooves around circumference of both fan and intermediate cases. Look for a clean, thin coating of grease covering the entire length and depth of each groove.
(c)If all mating surfaces are lubricated and are clear of excess grease and dirt, no further action is required. If any mating surface is dry, or if excess grease, any dirt, or other debris is detected on blades or in grooves, continue with this procedure.
(2)Clean Mating Surfaces. Use a clean, dry wiping cloth to remove all dirt, excess old lubricant, and any other foreign matter from all V-blades and V-grooves.
(3)Lubricate Mating Surfaces. Apply a thin coating of grease, Material No. P04-001 to all mating surfaces of V-blades and V-grooves. Avoid excess which could squeeze out when doors are closed. Method of application is not prescribed, but use of a clean brush is recommended.





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V-Blade and V-Groove Lubrication
Figure 201

3. Inspect and Adjust Thrust Reverser Doors to Maintain Cowl Load Share

A. Job Set-Up
(1)Make certain that thrust reverser doors are closed and latched.
(2)Open, safety and tag the appropriate circuit breakers and open the fan cowl doors (Ref. 71-13-00, P. Block 301).

B. Procedure (Ref. Fig. 202, 203, 204)
(Ref. Fig. 205, 206, 207)
NOTE : This procedure provides for routine inspection of latches and adjustment of latch loads on thrust reverser doors, to maintain engine performance by proper maintenance of the cowl load share system.
CAUTION : THIS PROCEDURE IS NOT APPROPRIATE FOLLOWING ENGINE CHANGE, EXHAUST NOZZLE CHANGE, OR THRUST REVERSER DOOR CHANGE. THOSE EVENTS REQUIRE COMPLETE THRUST REVERSER DOOR RIGGING IN ACCORDANCE WITH 71-13-03, P. BLOCK 501.
(1)Inspect for condition and adjust closing forces of forward circumferential latches. (Ref. Fig. 202)
(a)Simultaneously open both forward circumferential latches. Inspect latches for excessive wear on latch hooks, receivers, hinge bushings, the lower strap section, latch frames, and springs.
(b)Engage both latch hooks, then simultaneously close both latches.
NOTE : Latches are closed simultaneously to avoid rotating the circumferential band.
(c)Open, but do not unhook, one latch. Then close it, using push gage at the tip of the latch handle to observe closing force. If satisfactory, force of 45-55 lbs (20.2-24.4 daN) is observed, leave the latch closed and repeat this step on the other latch. If both latch closing forces are satisfactory, proceed to step (2).
(d)If either latch closing force is not 45-55 lbs (20.2-2.44 daN), adjust to within that range.
1 Open and unhook the latch to be adjusted. Leave the other one closed.
2 Loosen locknut on threaded hook shank.
Tun hook clockwise (screw it in) to increase, or counterclockwise (screw it out) to decrease closing force. Tighten locknut.
3 Use push gage to recheck latch closing forces. Repeat adjustment as necessary until closing force is within specifications.
(2)When closing forces check satisfactorily on both latches, open and then simultaneously close both latches.
(3)Open the two bifurcation latch access doors at the bottom centerline of the thrust reverser doors. (Ref. Fig. 203)
(4)Inspect for condition and adjust closing forces of three bifurcation latches. (Ref. Fig. 204)
(a)Release and relatch bifurcation latches, one at a time. While each latch is open, inspect for excessive wear on latch hook, receiver, hinge bushings, latch frame, and spring.
While closing latch, use push gage at tip of latch handle to check for satisfactory closing force of 50-60 lbs ((22.2 - 26.7 daN).
If all three latch closing forces are satisfactory, proceed to

step (5).

(b)For any latch with closing force outside of specified range, adjust as follows. (Ref. Fig. 205)

1 Open latch. Turn slotted nut on latch bolt housing with 0.15 in. (3.97 mm) hex wrench to increase or decrease effective length of eye bolt.

NOTE : Increasing effective length of eye bolt decreases closing force, and vice versa.

2 Close latch with push gage at tip of handle. Check for closing force of 50-60 lbs (22.2 - 26.7 daN). Repeat adjustment as necessary until this closing force is obtained.

(5)For doors without SB 78-13 incorporated, verify that a minimum of 50 percent metal-to-metal contact exists at forward, center, and aft latch housing contact pads. If contact is less than 50 percent, reshim as necessary. (Ref. 71-13-03, P. Block 501).

NOTE : Service Bulletin 78-13 directs installation of new latch housing hardware. Rectangular and radiused plates and shims are replaced by spherical plates with threaded adjustment feature.

(6)Make certain that three bifurcation latches are closed.
Close access doors.

(7)Inspect for condition and adjust closing forces of load share toggle latches. (Ref. Fig. 206)

CAUTION : BEFORE CHECKING CLOSING FORCE OF EITHER TOGGLE LATCH, THE OTHER MUST BE ENGAGED IN ITS TENSION STRAP RECEPTACLE AND FULLY CLOSED. A STRONG SNAP FELT WHILE CLOSING THE LATCH INDICATES PROPER CLOSURE.

(a)Open one toggle latch. Inspect for good condition of toggle pin, receiver, hinge bushings, latch frame, and two springs.

NOTE : To open a closed toggle latch, press a small rod or tool through the hole in the latch handle.

(b)Engage toggle pin and close latch with push gage at tip of latch handle.
Check for satisfactory closing force of 10-50 lbs (4.45 - 22.24 daN.).
If force is not satisfactory, adjust as follows. (Ref. Fig. 207)

1 Open latch and remove lockwire between toggle pin and locknut.

2 Loosen locknut and turn toggle pin in or out to decrease or increase closing force. Tighten locknut.

3 Recheck closing force. If necessary, repeat this procedure until force of 10-50 lbs (4.45 - 22.24 daN.) is achieved.

4 Wirelock locknut to toggle pin without rotating pin.

5 Engage toggle pin in receptacle and close latch, feeling for strong snap indicating proper closure.

(c)Repeat steps (a) and (b) for the other toggle latch.

(8)Inspect for condition and adjust closing force of aft circumferential latch. (Ref. Fig. 206)

(a)Open latch and inspect for excessive wear or poor condition of latch hook, receiver, hinge bushings, latch frame, and spring.

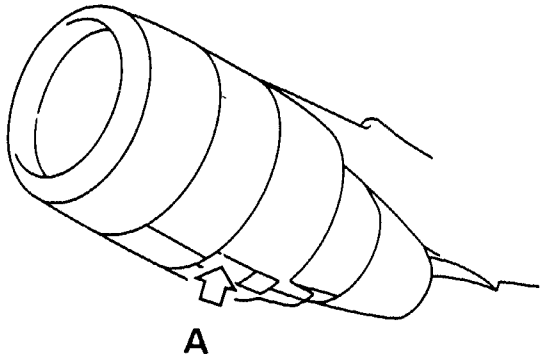
(b)Check for satisfactory closing force of 70-80 lbs (31.14 - 35.58 daN.), using push gage positioned 0.25 in. (6.35 mm) in from end of latch handle. If closing force is not within this range, open latch and adjust as follows. (Ref. Fig. 207)

1 Remove two screws attaching adjustment access panel on right thrust reverser door.
2 Turn adjustment screw in latch with 0.22 in. (5.60 mm) hex wrench to increase or decrease closing force.
3 Repeat step (b) as necessary until closing force of 70-80 lbs (31.14 - 35.58 daN) is obtained.
4 Reinstall access panel on thrust reverser door.

(9) Verify that aft circumferential latch housings make metal-to-metal contact at least 0.38 in. (9.652 mm) forward and aft of latch hook when latch is closed. If not, reshim housing face plate as necessary to achieve this contact.

C. Close-Up

(1) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



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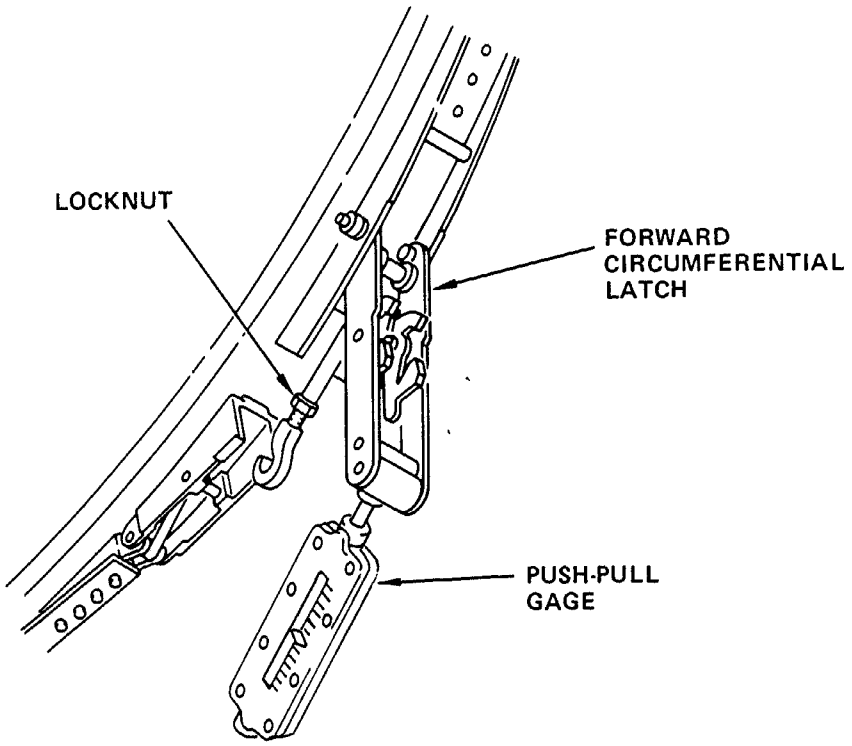

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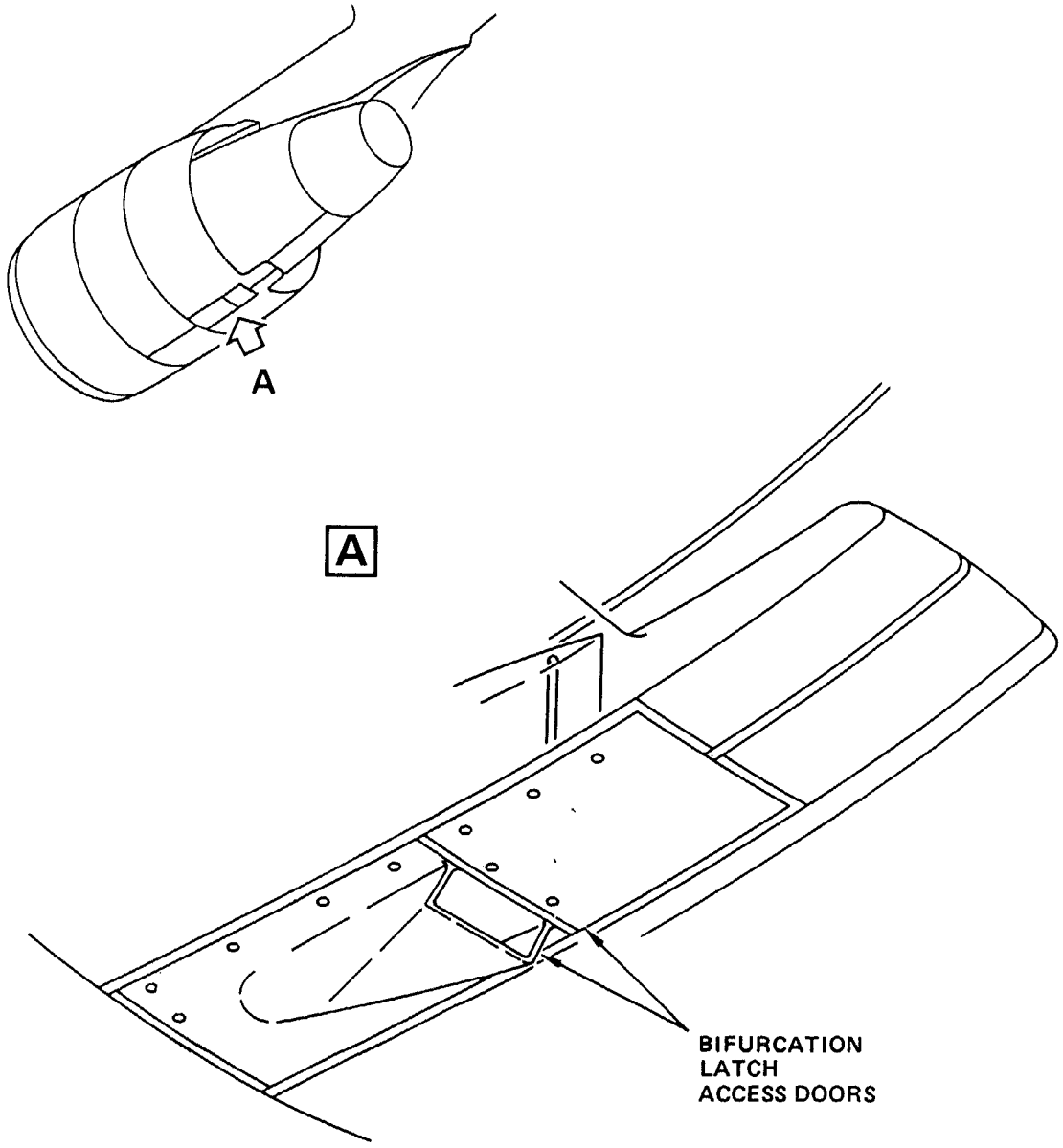
Forward Circumferential Latch Adjustment
Figure 202



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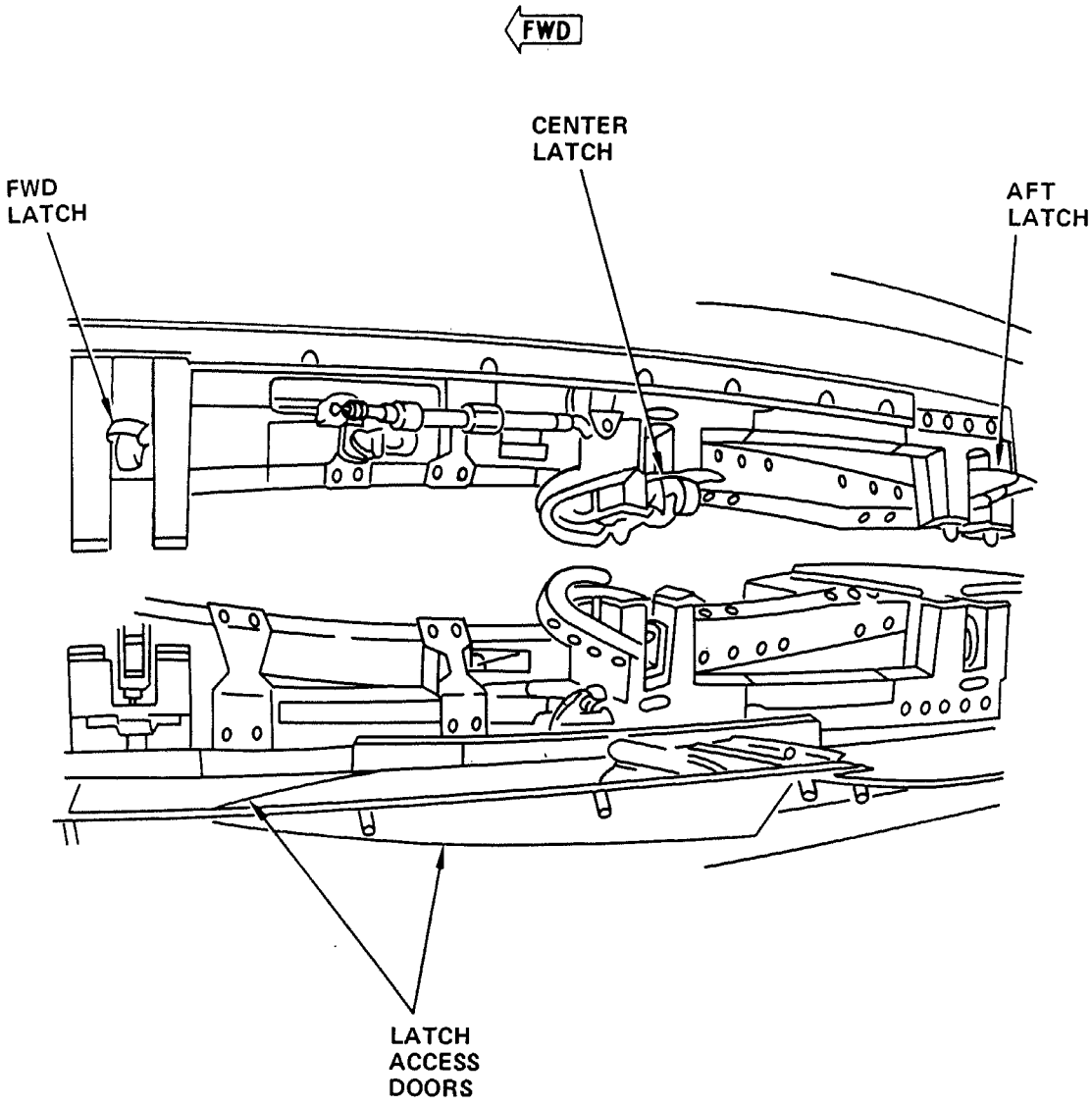
Bifurcation Latch Access Doors
Figure 203



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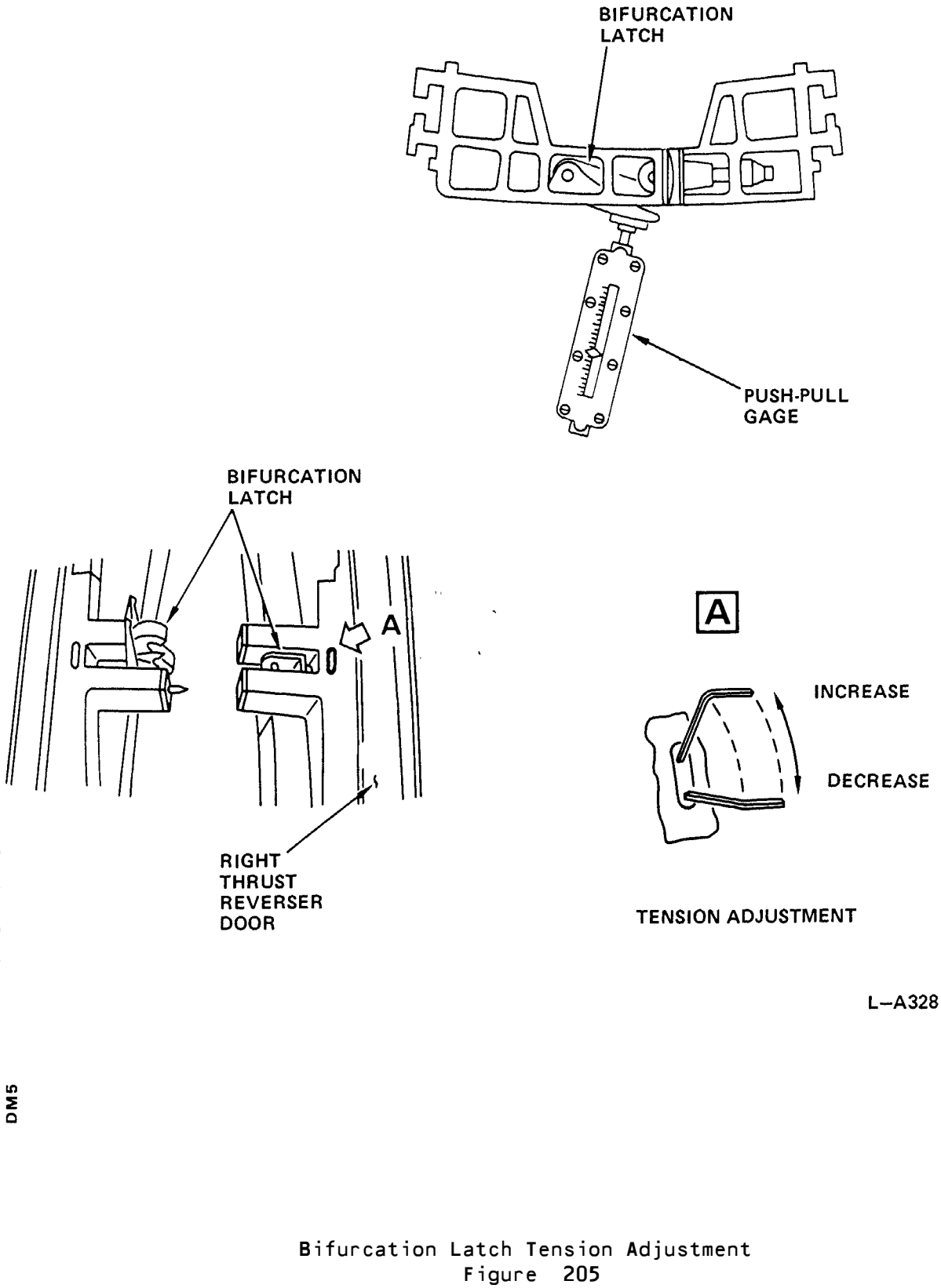
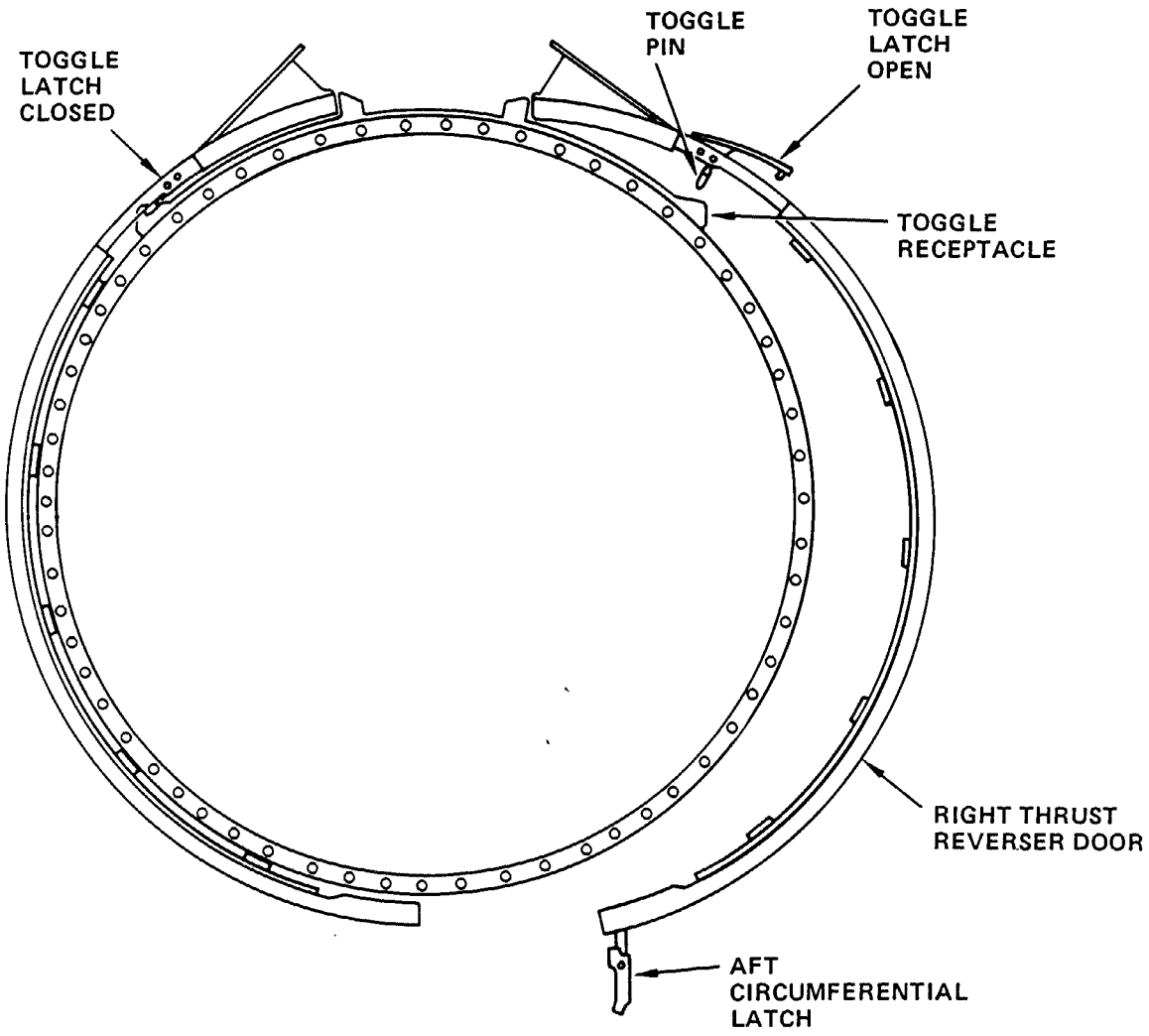
Bifurcation Latch Assemblies
Figure 204



Bifurcation Latch Tension Adjustment
Figure 205



BM5 71 13 03 2 KJMO - 24 - 19
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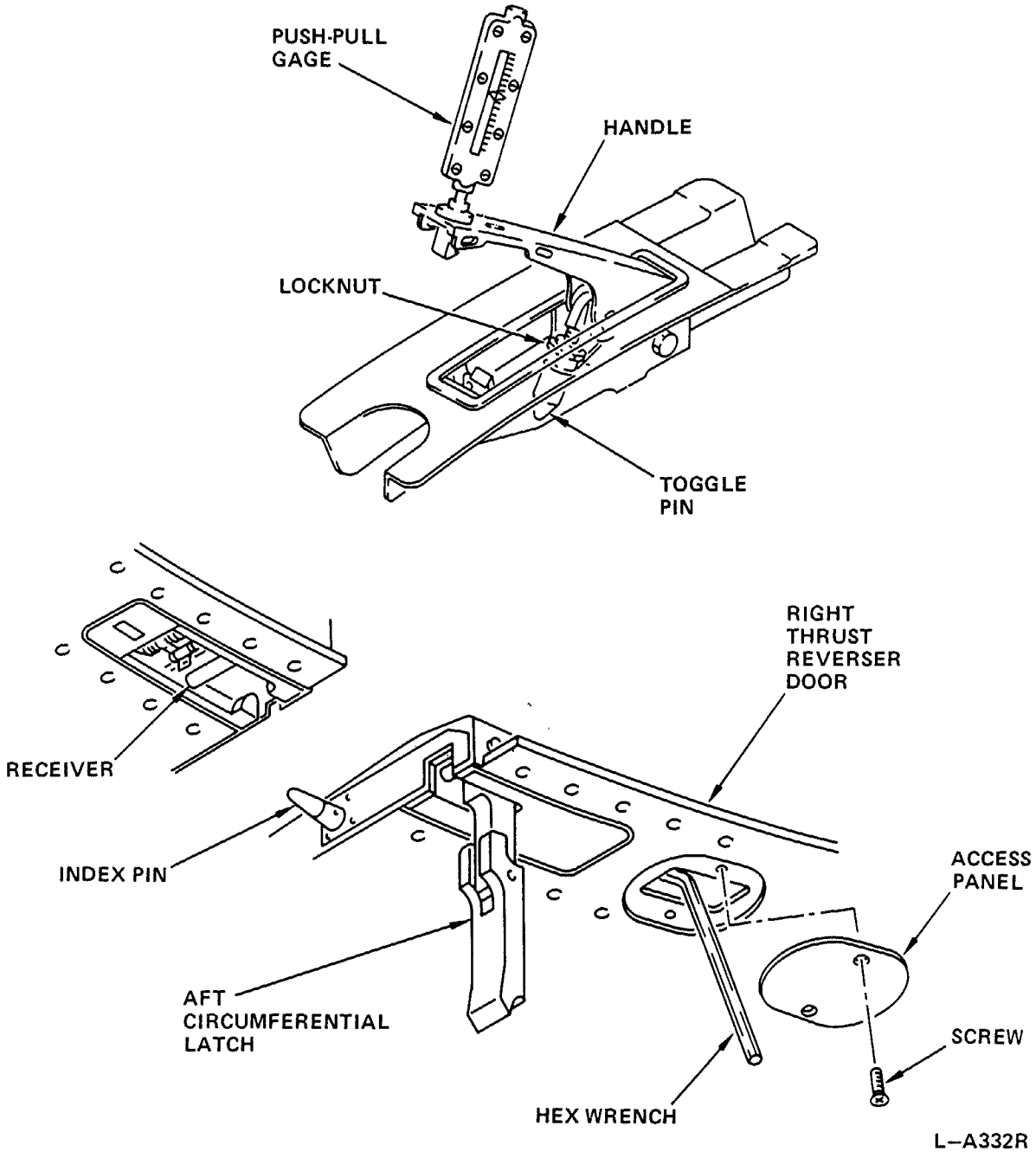
Aft Circumferential Latch and Load Share Toggle Latches
Figure 206



BM5 71 13 03 2 KLMO - 24 - 19
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Aft Circumferential Latch and Toggle Latch Adjustments
Figure 207

FAN THRUST REVERSER COWL - REMOVAL/INSTALLATION

1. General

CAUTION : SIGNIFICANT FLIGHT OPERATIONAL INTERMIX CONCERNS EXIST BETWEEN ENGINES AND THRUST REVERSERS. REF. 71-00-10, P. BLOCK 201 PRIOR TO THRUST REVERSER INSTALLATION.

A. Prior to replacing the fan thrust reverser cowl refer to Thrust Reverser Door Interchangeability and refer to Engine Component Intermix (Ref. 71-00-10, P. Block 201).

B. Thrust Reverser Door Interchangeability

(1)General

CAUTION : MAKE SURE THE THRUST REVERSER IS THE CORRECT CONFIGURATION FOR THE ENGINE AND NOZZLE YOU HAVE INSTALLED. AS A RESULT OF THE INCORPORATION OF SB PW4ENG 72-756 OR PW4ENG 72-759, MODIFICATION OF THE HPC TO INCORPORATE A RING CASE CONFIGURATION (RCC), IT IS NOT ACCEPTABLE, DUE TO WEIGHT RESTRICTIONS, TO INSTALL A POST SB 72-756 OR SB 72-759 ENGINE ON-WING IN COMBINATION WITH A THRUST REVERSER IMPROVEMENT PROGRAM (TRIP) CONFIGURATION THRUST REVERSERS (S/N 0714001 AND ON) AND INCONEL EXHAUST NOZZLES (S/N 1 THROUGH 0744001) IF ANY OF THE FOLLOWING OPTIONS ARE INCLUDED ON THE NACELLE : SCU, ACOUSTICALLY TREATED INLET OR ACOUSTIC PLUG. REFER TO INSPECTION SB PW4NAC 78-111 THAT DEFINES THE DISALLOWED COMBINATIONS WHICH WILL RESULT IN AN UNACCEPTABLE PROPULSION SYSTEM WEIGHT.

(a)This maintenance practice provides the approved intermix instructions (Ref. Table 401) for the installation of doors for :

1 Phase I, Pre TRIP;
2 Phase I, TRIP;
3 Phase III, Pre TRIP; and
4 Phase III, TRIP configurations.

NOTE : Pre Serial No. 0714001 Thrust Reversers will be referred to as a Pre TRIP configuration. Post Serial No. 0714001 Thrust Reversers will be referred to as a TRIP configuration.

DOOR CONFIGURATION	PH I, PRE TRIP	PH I, TRIP	PH III, PRE TRIP	PH III, TRIP
Phase I, Pre TRIP 221-4125-511, -517, -519, -549, -551, -565, -567, -569, -571, -577, -579	Yes	Yes	No *	No *
Phase I, TRIP 221-4125-1009, -1011 -1013, -1015	Yes	Yes	No *	No *
Phase III, Pre TRIP 221-4125-585, -587,	No *	No *	Yes	Yes

DOOR CONFIGURATION	PH I, PRE TRIP	PH I, TRIP	PH III, PRE TRIP	PH III, TRIP
-589, -591				
Phase III, TRIP 221-4125-1001, -1003, -1005, -1007	No *	No *	Yes	Yes

* It is not permissible to mix Phase I and Phase III thrust reverser halves. For Thrust Reverser/Engine combinations, ref. 71-00-10, P. Block 201. It is not permitted to mix Phase I and Phase III configuration translating sleeves.

Table 401

(b)Hinge attachment bolts and upper hinge access doors are specific to Pre TRIP configurations or TRIP configurations.

(c)Operators are required to honor part number limitations relative to options and other non-interchangeable conditions. Refer to the Power Plant IPC for more detail.

NOTE : The translating sleeve and blocker doors manufactured without wire mesh acoustic surface are fully interchangeable with a translating sleeve and blocker doors with wire mesh acoustic treatment. However, it is not permissible to mix Phase I and Phase III configuration translating sleeves.

2. Equipment and Materials

	ITEM	DESIGNATION
	A. RSE1005	Sling, Thrust Reverser Doors
R	B. RSE1107	Handling Dolly (Left/Right Set) (recommended)
	C. RSE1015	Thread Protector, T/R Hinge Bolts
R	D. RSE1108	Handling Dolly (Left only) (alternative to
R		RSE 1107)
R	E. RSE1109	Handling Dolly (Right only) (alternative to RSE 1107)
	F. RSE1111	Pump, Hydraulic, Hand Operated
	G. RSE1018	Plug, Reverser Exhaust
	H. Material No.P03-001	Oils (Ref. 70-00-00)
	I. Material No.P04-001	Common Greases (Ref. 70-00-00)
	J Material No.P06-020	Lubricants (Ref. 70-00-00)
	K.	Cotter pins
	L.	Circuit Breaker Safety Clip
	M.	Protective Covers
	N.	Universal Attach Pad
	P.	Access Platform
	Referenced Procedures	
	- 71-00-10, P. Block 201	Engine Component Intermix

ITEM	DESIGNATION
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl
- 78-32-11, P. Block 201	Thrust Reverser Translating Sleeves
- 71-13-02, P. Block 401	Fan Cowl
- 78-31-00, P. Block 501	Thrust Reverser Actuation System
- 78-31-12, P. Block 401	Fan Reverser Flexible Shaft Assy
- 78-32-11, P. Block 501	Thrust Reverser Translating Sleeves
- 78-32-16, P. Block 401	Thrust Reverser Cascade Support Frame assembly

**ON A/C 101-200,

3. Procedure

A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75
For engine 1			
133VU	ENGINES/ENG1 REVERSE CTL	1KM	332/U69
133VU	ENGINES/ENG1 REVERSE WARN	3KM	332/U68
133VU	ENGINES/ENG1/THRUST REVERSER LOCK	45KM	332/U67
22VU	ENG FIRE DET/ENG1 LOOP A	1WD	209/A19
22VU	ENG FIRE DET/ENG1 LOOP B	3WD	209/A20
133VU	ENG1/SCU SUPPLY GND	35KS	333/T76
133VU	ENG1/SCU SUPPLY FLT	37KS	333/T75
For engine 2			
133VU	ENGINES/ENG2 REV CTL	2KM	331/V74
133VU	ENGINES/ENG2 REV WARN	4KM	331/V73
133VU	ENGINES/ENG2/THRUST REVERSER LOCK	44KM	331/V75
22VU	ENG FIRE DET/ENG2 LOOP A	2WD	209/A24
22VU	ENG FIRE DET/ENG2 LOOP B	4WD	209/A23
133VU	ENG2/SCU SUPPLY GND	34KS	333/T85
133VU	ENG2/SCU SUPPLY FLT	36KS	333/T84

(2)Install access platform.
(3)Open fan cowl door (Ref. 71-13-02, P. Block 301).
(4)Remove fan cowl door (Ref. 71-13-02, P. Block 401).

**ON A/C 101-200,

B. Removal (Ref. Fig. 401) (Sheets 1 and 2)

(1)Remove bolts (2), (3), (4) attaching fairing (1) to thrust reverser hinges and to pylon, and remove fairing (Ref. Fig. 405).

(2)Rotate hinged fairing supports toward translating sleeve tracks and temporarily secure with tape.

(3)Remove electrical cable clamps between door and pylon bracket connectors.

(4)At pylon connector brackets, disconnect electrical connectors D5003P, D5018P and D4986P, for left hand door (D5019P, D4987P and D5008P for right hand door), and place protective covers on electrical connectors and receptacles.

(5)On the thrust reverser, disconnect the electrical connector D5055P for the left hand door (D5054P for the right hand door), and place protective covers on the electrical connectors and receptacles. Remove the string tie attaching 21W4068 harness to other harness (Ref. Fig. 402).

(6)At pylon, disconnect two pressure sensing lines from bracket mounted unions. Install protective covers.

(7)At pylon, remove attaching hardware from master actuator flexible shaft to splitter gearbox and disengage flexible shaft.

(8)Install protective covers on splitter gearbox.

(9)At pylon, remove clevis pin (1) and cotter pin (3) from circumferential latch link assembly (Ref. Fig. 403).

(10)On thrust reverser door, disconnect coupling nut of hose (1) from elbow (2) (Ref. Fig. 406). Install protective covers.

(11)On thrust reveser door, remove hoist attach point plugs and retain for re-installation (Ref. Fig. 404).

(12)Position RSE1005 Thrust Reverser Door Sling over thrust reverser door using bolts (1), (2) and attach pads to door hoist points. (Ref. Fig. 404).

(13)Attach sling to hoist and adjust individual sling straps.

(14)Unlatch thrust reverser doors (Ref. 71-13-00, P. Block 301).

(15)Connect RSE1111 hydraulic pump at door manifold, left side.

WARNING : ENSURE HYDRAULIC PUMP IS PROPERLY CONNECTED TO THRUST REVERSER MATING CONNECTOR BY PULLING ON PUMP HOSE WITH MODERATE FORCE. CONNECTION MUST BE MADE CORRECTLY, OTHERWISE THRUST REVERSER DOOR OPENING SYSTEM WILL NOT BE PRESSURIZED AND REVERSER DOOR CAN CLOSE UNEXPECTEDLY.

(16)Actuate pump and open door 53 degrees to fully open position.

(17)Remove all slack from sling.

(18)Ensure that sling is supporting weight of thrust reverser door.

(19)At the pylon, remove the bolt (4), washers (12) and (13), nut (5) and cotter pin (6) from the door opening actuator at pylon mounting bracket and retract by releasing pressure at hydraulic pump (Ref. Fig. 403).

(20)Secure retracted door opening actuator to pre-cooler duct on thrust reverser door.

(21)Disconnect hydraulic pump from manifold.

(22)Remove nut (11) and washer (10) from forward and aft hinge botls (8) and

install RSE1015 Thread Protectors on bolts (Ref. Fig. 403).
(23)Remove bolts (8) and the washers (9) from forward and aft hinges to pylon fittings and remove thread protectors.
(24)With hoist, carefully move thrust reverser door clear of pylon hinge hook.
(25)With hoist, lower door on RSE1107, RSE1108 or RSE1109 Handlling Dolly and secure with bolts, washers and 0.148 in. (3.759 mm) cotter pins through hinge points.
(26)Lower sling until all straps are slack and remove attach pads from thrust reverser door.
(27)Install hoist point plugs in door attach points.

**ON A/C 101-200,

C. Installation

CAUTION : SIGNIFICANT FLIGHT OPERATIONAL INTERMIX CONCERNS EXIST BETWEEN ENGINES AND THRUST REVERSERS. REF. 71-00-10, P. BLOCK 201 PRIOR TO THRUST REVERSER INSTALLATION.

CAUTION : PRE-SERVICE BULLETIN PW4NAC 78-65 : A POSSIBLE MISALIGNMENT MAY EXIST BETWEEN LEFT HAND AND RIGHT HAND THRUST REVERSER HALVES. ALIGNMENT PINS MAY NOT MATCH WITH CORRESPONDING BEARING PLATE RECEPTACLE, RISKING THRUST REVERSER INTERCHANGEABILITY.
POST-SERVICE BULLETIN PW4NAC 78-65 :
INCORPORATION OF SERVICE BULLETIN EXEMPTS THRUST REVERSERS FROM THE POSSIBLE MISALIGNMENT BETWEEN ALIGNMENT PINS AND CORRESPONDING BEARING PLATE RECEPTACLES.

CAUTION : BIFURCATION LATCH AND DEFLECTION LIMITER SHIM PACKAGES HAVE STRIPE OF RED PAINT TO INDICATE REVERSER ADJUSTMENT HAS BEEN ACCOMPLISHED.
VERIFY THAT PAINT HAS NOT BEEN DISTURBED OR COWL INSTALLATION AND CLOSING PROBLEMS CAN OCCUR.

CAUTION : MAKE SURE THE THRUST REVERSER AND NOZZLE ARE THE CORRECT CONFIGURATION FOR THE ENGINE YOU HAVE INSTALLED. AS A RESULT OF THE INCORPORATION OF SB PW4ENG 72-756 OR PW4ENG 72-759, MODIFICATION OF THE HPC TO INCORPORATE A RING CASE CONFIGURATION (RCC), IT IS NOT ACCEPTABLE, DUE TO WEIGHT RESTRICTIONS, TO INSTALL A POST SB 72-756 OR SB 72-759 ENGINE ON-WING IN COMBINATION WITH A THRUST REVERSER IMPROVEMENT PROGRAM (TRIP) CONFIGURATION THRUST REVERSERS (S/N 0714001 AND ON) AND INCONEL EXHAUST NOZZLES (S/N 1 THROUGH 0744001) IF ANY OF THE FOLLOWING OPTIONS ARE INCLUDED ON THE NACELLE : SCU, ACOUSTICALLY TREATED INLET OR ACOUSTIC PLUG. REFER TO INSPECTION SB PW4NAC 78-111 THAT DEFINES THE DISALLOWED COMBINATIONS WHICH WILL RESULT IN AN UNACCEPTABLE PROPULSION SYSTEM WEIGHT.

(1)On handling dolly, remove hoist point filler plugs from thrust reverser door hoist attach points and install RSE1005 Sling attach pad using bolts (1) and (2) (Ref. Fig. 404).
(2)Position hoist over thrust reverser door.
(3)Attach sling to hoist, adjust individual sling straps, and remove slack (Ref. Fig. 404).

(4)Remove cotter pins, washers, bolts and shipping restraints attaching thrust reverser door to shipping container or handling dolly.
(5)Remove door from handling dolly.
(6)Lubricate threads of hinge bolt (8) with Engine Oil (Material No.P03-001). Place one washer (9) under head of hinge bolt and install with bolt head pointing forward in center thrust reverser door hinge (Ref. Fig. 403).
(7)Install washer (10) and nut (11) on hinge bolt (8) and TORQUE nut to between 480 and 690 lbf. in. (5.42 and 7.80 m.daN) (Ref. Fig. 403).
(8)Lubricate fan case and engine V-grooves and thrust reverser door V-blades with grease Material No.P04-001 (Ref. 71-13-03, P. Block 201).
(9)Remove lockwire from latch toggle at aft end of thrust reverser door and rotate on threaded shaft to fully retracted (shortest) position.
(10)At pylon, rotate fairing supports toward tracks and tape in position.
(11)With hoist, position thrust reverser door at full open position of 53 degrees and engage center door hinge onto pylon center hinge hook.
(12)Lubricate threads of forward and aft hinge bolts (8) with Engine Oil (Material No.P03-001). Install one washer (9) under head of forward hinge bolt (8) and one washer (9) under head of aft bolt (8) (Ref. Fig. 403).
(13)Install RSE1015 Thread Protectors on forward and aft hinge bolts (8).
(14)Install forward hinge bolt (8) with bolt head facing forward and aft hinge bolt (8) head facing aft.

R NOTE : Both installation directions of hinge bolts (8) are allowed.

(15)Remove thread protectors.
(16)Install one washer and one nut on each hinge bolt and TORQUE to between 480 and 690 lbf. in. (5.42 and 7.80 m.daN).
(17)With hoist, continue holding door at approximately 53 degrees.

WARNING : ENSURE HYDRAULIC PUMP IS PROPERLY CONNECTED TO THRUST REVERSER MATING CONNECTOR BY PULLING ON PUMP HOSE WITH MODERATE FORCE. CONNECTION MUST BE MADE CORRECTLY, OTHERWISE THRUST REVERSER DOOR OPENING SYSTEM WILL NOT BE PRESSURIZED AND REVERSER DOOR CAN CLOSE UNEXPECTEDLY.

(18)Connect hydraulic pump at thrust reverser door manifold.
(19)Remove door actuator from temporary tie-down and apply pressure with hydraulic pump until door actuator is extended the proper distance for installation.
(20)Attach door opening actuator to pylon bracket with bolt (4) and nut (5). TORQUE nut to between 50 and 70 lbf. in. (0.56 and 0.79 m.daN) and install cotter pin (6) (Ref. Fig. 403).

WARNING : INCOMPLETE BLEEDING OF THRUST REVERSER DOOR ACTUATOR SYSTEM WILL RESULT IN ENTRAPPED AIR.
ENTRAPPED AIR IN SYSTEM CAN ALLOW DOOR TO CLOSE ABRUPTLY RESULTING IN SEVERE INJURY TO PERSONNEL.

(21)Bleed thrust reverser door actuator system.
(a)Ensure that all personnel are clear of door.
(b)With hoist, slowly lower sling approximately two feet (0.610 m).
(c)With pump, slowly reduce pressure to allow door to close gradually until slack in sling straps has been removed.
(d)Continue this procedure until door is completely closed.
(e)With pump, apply hydraulic pressure until door is fully opened to 53 degrees.

(f)Slowly reduce hydraulic pressure to allow door to close gradually.
(g)Repeat opening and closing door three times to bleed entrapped air from system.

(22)With hydraulic pump, raise door to fully opened position and remove all slack from sling.

CAUTION : DO NOT LUBRICATE AFT CIRCUMFERENTIAL LATCH TOGGLE PINS OR MATING RECEPTACLES.

(23)Using sling and door actuator, lower thrust reverser door, mating V-grooves on fan and engine cases with thrust reverser door V-blades. Door should close freely with blades engaging grooves without requiring external force or hand alignment. If door does not close easily, check for interference and perform bifurcation, circumferential, and toggle latch adjustment (Ref. 71-13-03, P. Block 501).
(24)Remove sling from hoist and remove sling attach pads.
(25)Install hoist point plugs in thrust reverser door hoist attach points.
(26)Install forward circumferential latch link assembly to latch strap (on top of thrust reverser door).
(27)Lubricate threads of bolts (2), (3) and (4) with engine oil Material No.P03-001. At pylon, remove tape temporarily securing hinged fairing supports at top of thrust reverser door, rotate fairing supports into position and install fairing with bolts (2), (3) and (4). TORQUE bolts to between 20 and 25 lbf. in. (0.23 and 0.29 m.daN) (Ref. Fig. 405).
(28)Remove all protective covers.

**ON A/C 101-200,

(29)Apply anti-seize compound Material No.P06-020 to threads of coupling nut of hose (1) and install on elbow (2) (Ref. Fig. 406). TORQUE coupling nut of hose to between 170 and 200 lbf.in. (1.92 and 2.26 m.daN).
(30)Connect two pressure sensing tubes to unions, outboard of splitter gearbox, and TORQUE connectors to between 270 and 300 lbf. in. (3.05 and 3.39 m.daN).
(31)Install master actuator flexible shaft to splitter gearbox (Ref. Fig. 401).
(a)Manually translate sleeve to fully stow position (Ref. 78-32-11, P. Block 201).
(b)Disconnect main drive flexible shaft from pneumatic drive unit (Ref. 78-31-12, P. Block 401).
(c)Disconnect master actuator flexible shaft of opposite side master actuator from splitter gearbox by removing screws (1).
(d)Synchronize both translating sleeves to full stow position (Ref. 78-31-00, P. Block 501).
(e)Lubricate threads of screws (1) with Engine Oil Material No.P03-001). Attach both translating sleeve master actuator flexible shafts to splitter gearbox with screws (1) and washers (2).
(f)TORQUE screw to between 20 and 25 lbf.in. (0.23 and 0.29 m.daN).
(g)Manually translate sleeves to nominal deploy. Hold in this position at one master actuator to prevent drifting.

(h)Attach pneumatic ground supply air hose to ground transfer valve on fan case, apply pressure and drive pneumatic drive unit to full deploy position.

(i)Install main drive flexible shaft in pneumatic drive unit (Ref. 78-31-12, P. Block 401).

(32)Connect electrical connectors D5003P, D5018P, and D4986P for the left hand door (D5019P, D4987P and D5008P for the right hand door) at pylon bracket junctions. Tighten finger- tight plus an additional one-eighth turn.

(33)Connect the electrical connector D5055P for the left hand (D5054P for the right hand) thrust reverser connector. Attach the 21W4068 harness to other harness with a string tie (Ref. Fig. 402).

(34)Install clamps on electrical connectors at all pylon clamps mounting brackets (Ref. Fig. 401).

(35)If installed, remove hydraulic pump.

(36)Perform the following adjustments (Ref. 71-13-03, P. Block 501).

NOTE : Bifurcation latch and deflection limiter shim packages have stripe of red paint to indicate reverser adjustment has been accomplished. Verify that paint has not been disturbed or door installation and closing problems can occur (Ref. 71-13-03, P. Block 501).

(a)Reverser fit check.

(b)Latch load check.

(c)Toggle pin adjustment.

(37)Perform gap measurement procedures between aft cascade ring bumper pads and translating sleeve ramps (Ref. 78-32-16, P. Block 401).

**ON A/C 101-200,

D. Close-Up

(1)Close thrust reverser doors (Ref. 71-13-00, P. Block 301).

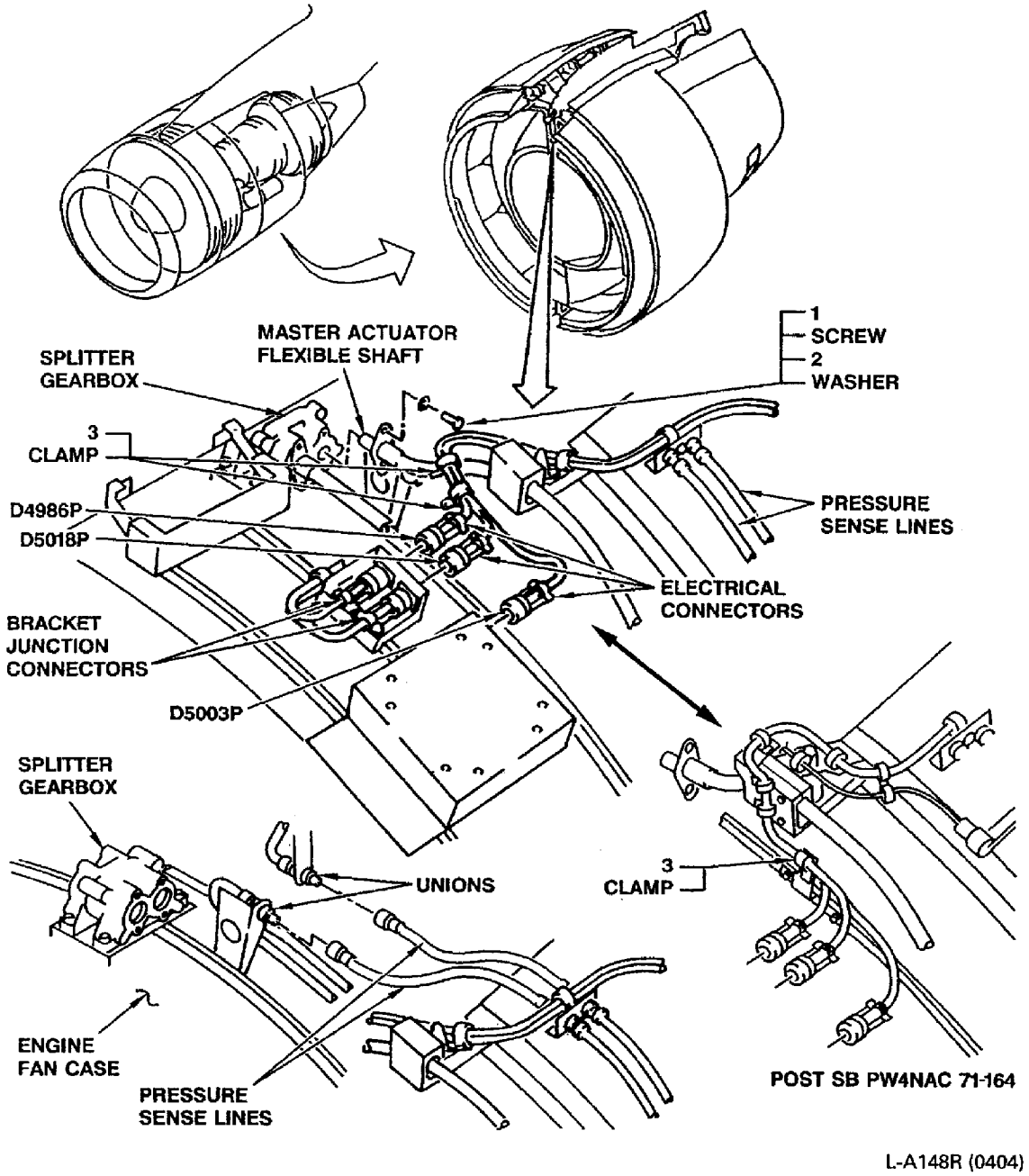
(2)Install fan cowl doors (Ref. 71-13-02, P. Block 401).

(3)Remove safety clips and tags and close circuit breakers 3KU, for engine 1 1KM, 3KM, 45KM, 1WD, 3WD, 35KS, 37KS, for engine 2 2KM, 44KM, 4KM, 2WD, 4WD, 34KS, 36KS.

NOTE : Install RSE1018-1, Reverser Exhaust Plug, if aircraft is not being returned to service.

(4)Remove access platform.

(5)Perform the operational test for thrust reverser translating sleeves (Ref. 78-32-11, P. Block 501).



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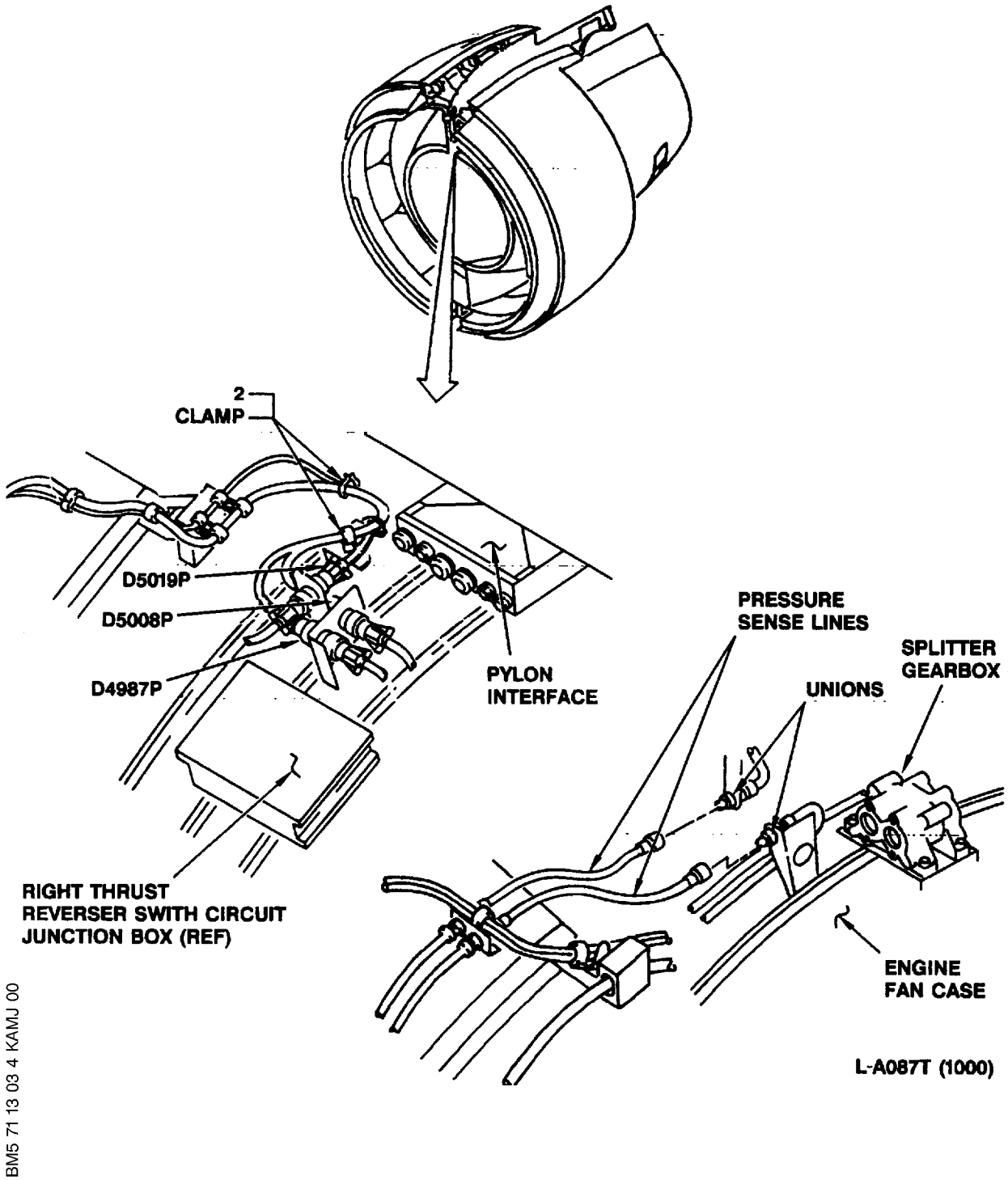
Fan Thrust Reverser Door - Connections at Pylon (Sheet 1)
Figure 401



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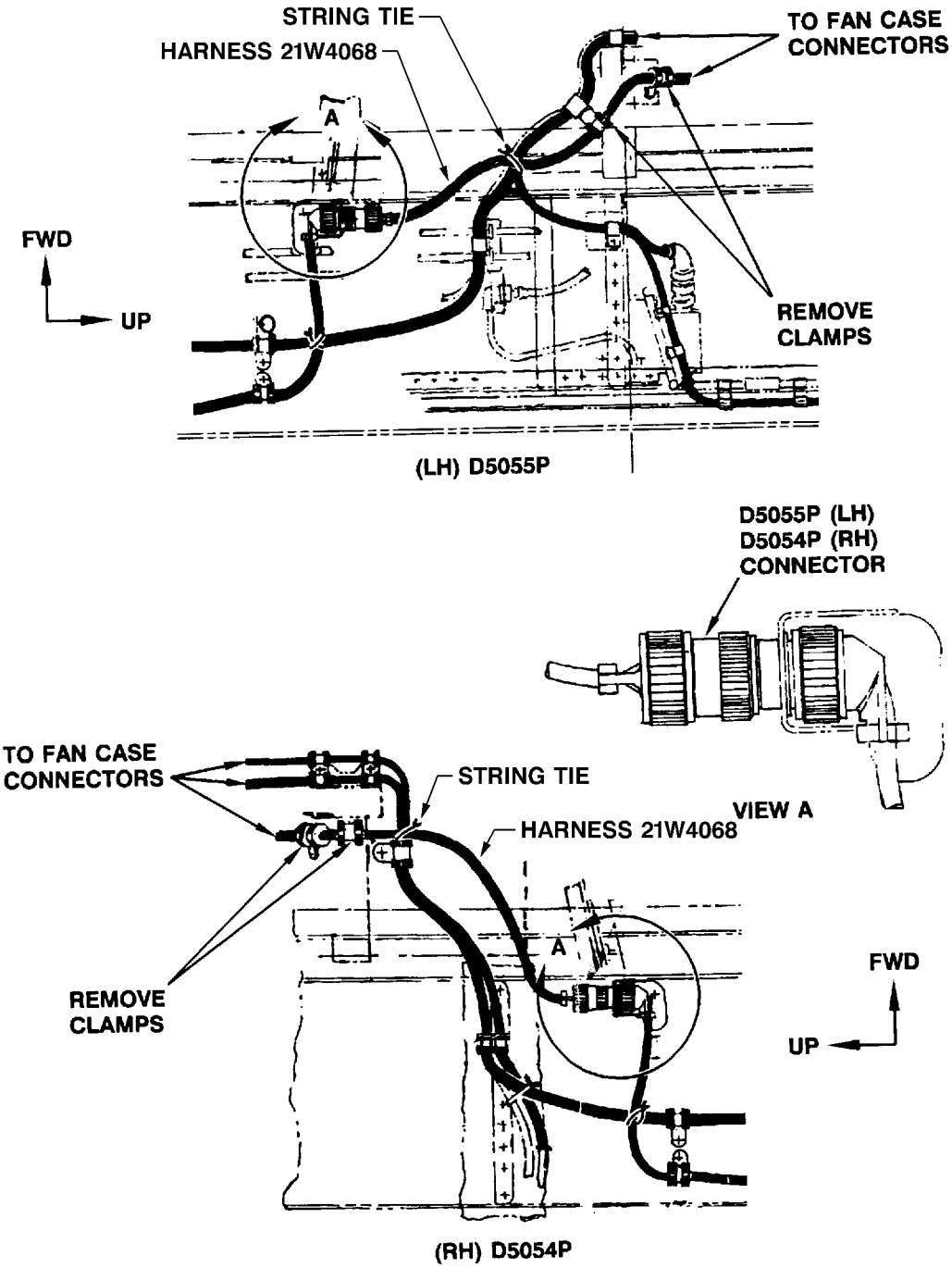
Fan Thrust Reverser Door - Connections at Pylon (Sheet 2)
Figure 401



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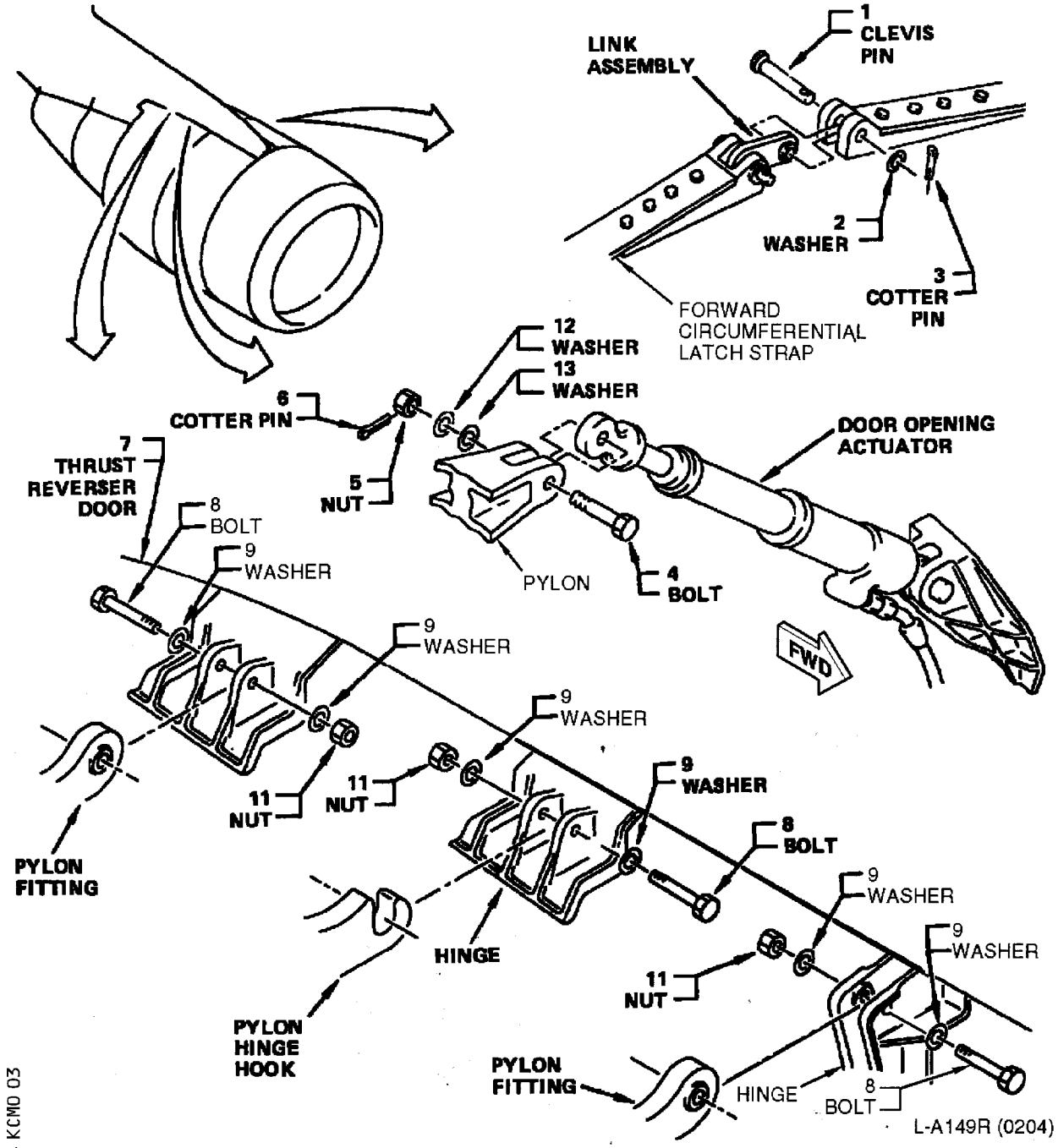
Wiring Connection on Thrust Reverser
Figure 402



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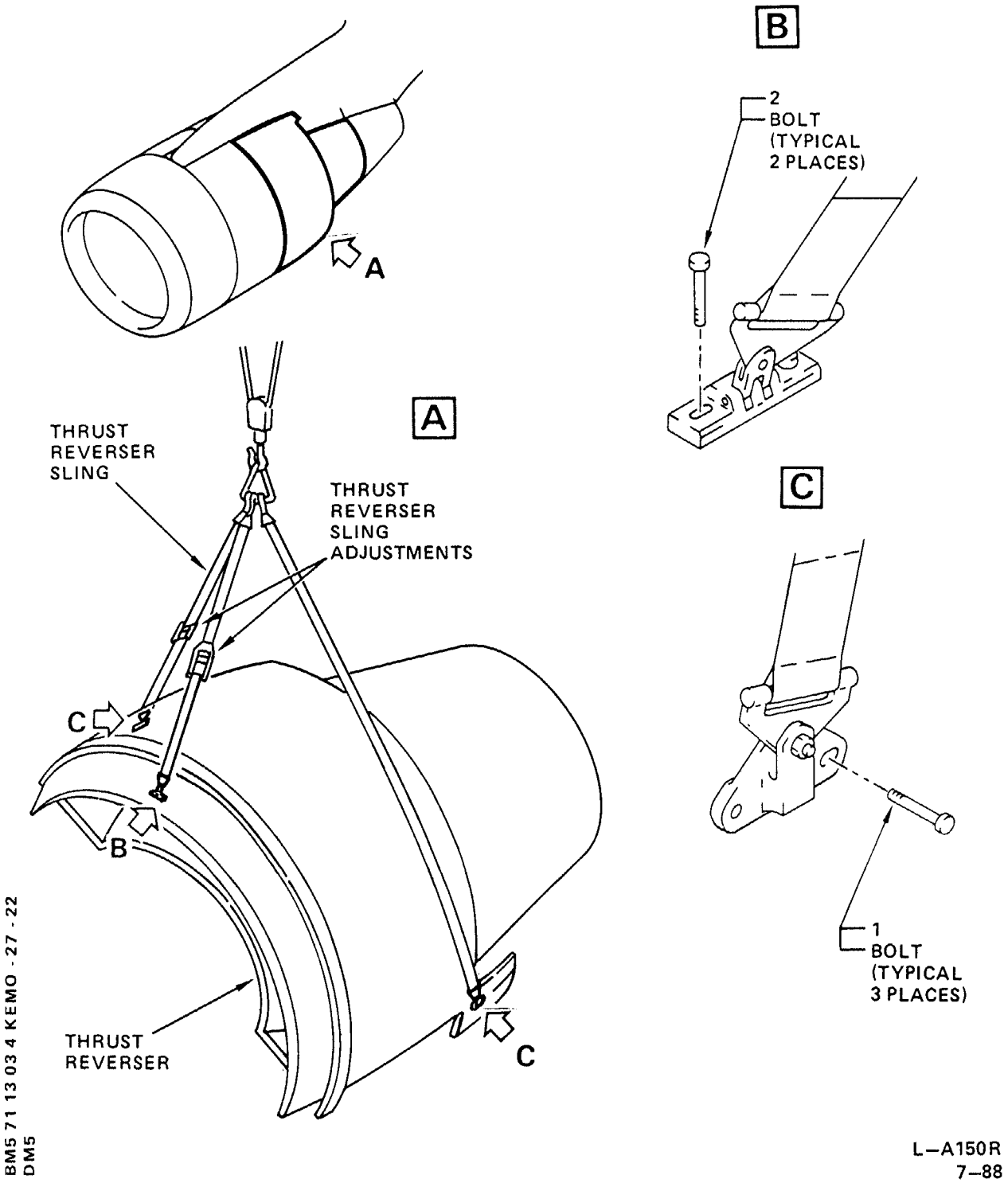
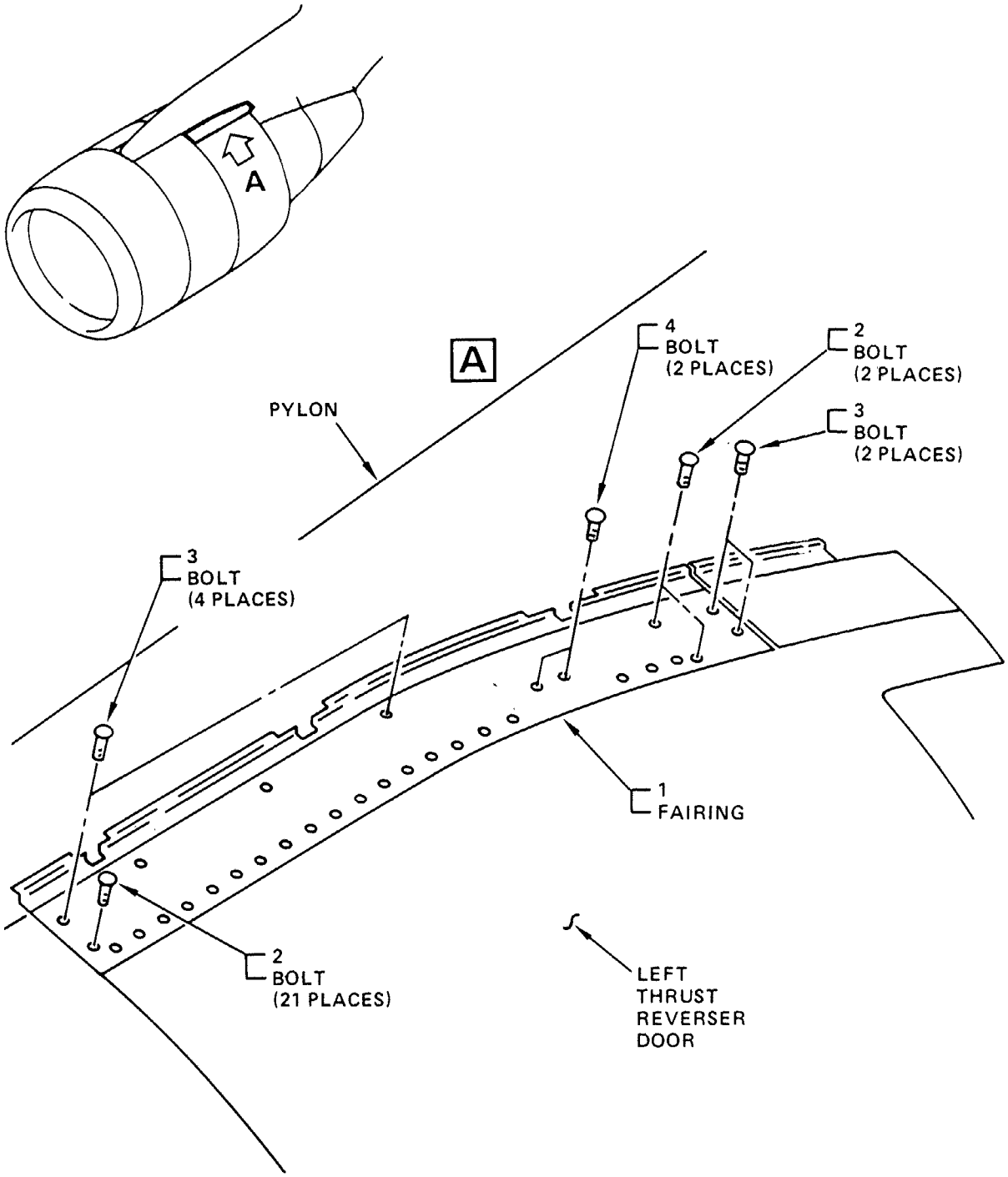
Fan Thrust Reverser Door - Attaching Points at Pylon
Figure 403

R



Thrust Reverser Door Sling
Figure 404



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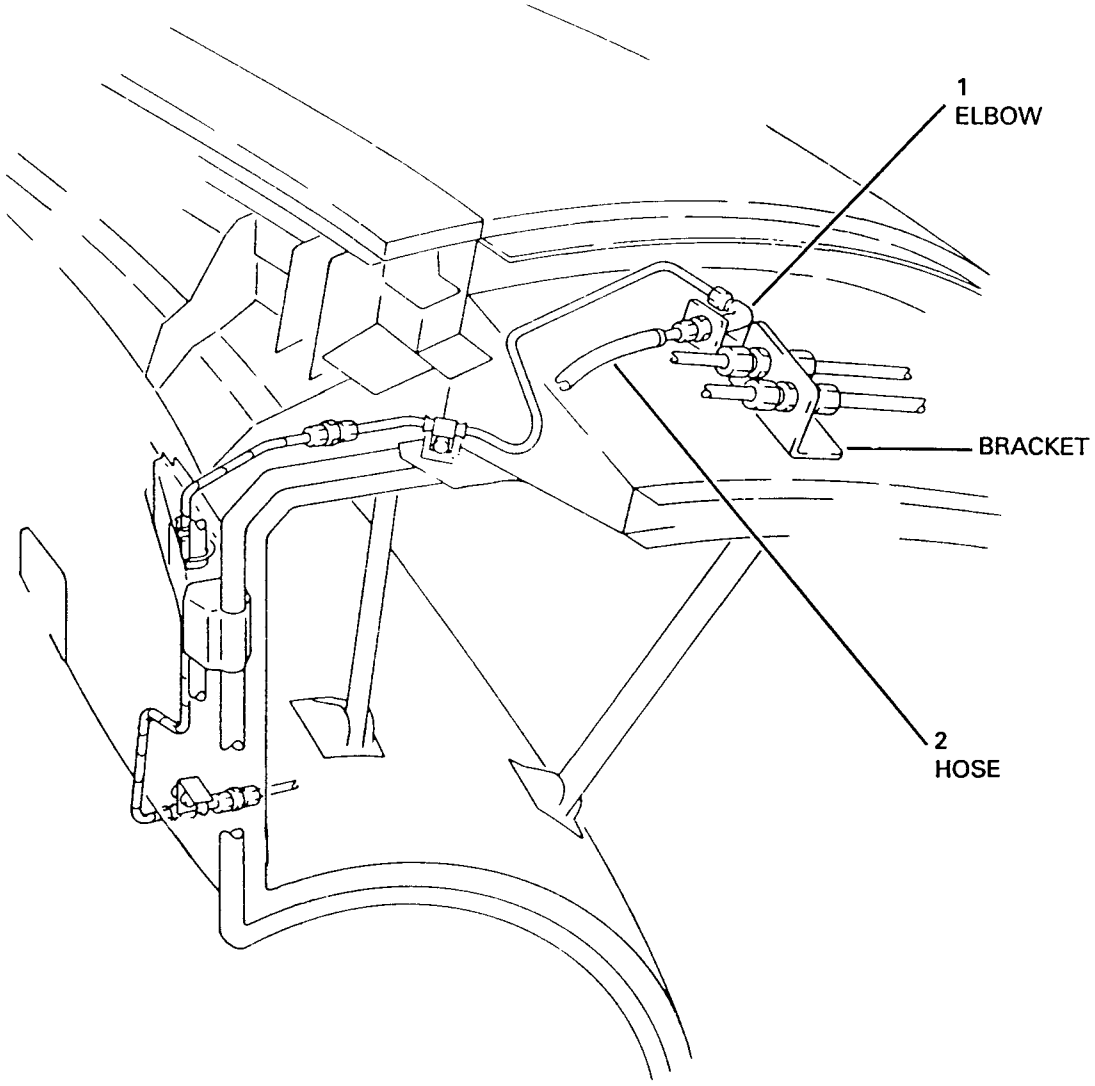
Thrust Reverser Door Upper Bifurcation Removable Fairing
Figure 405



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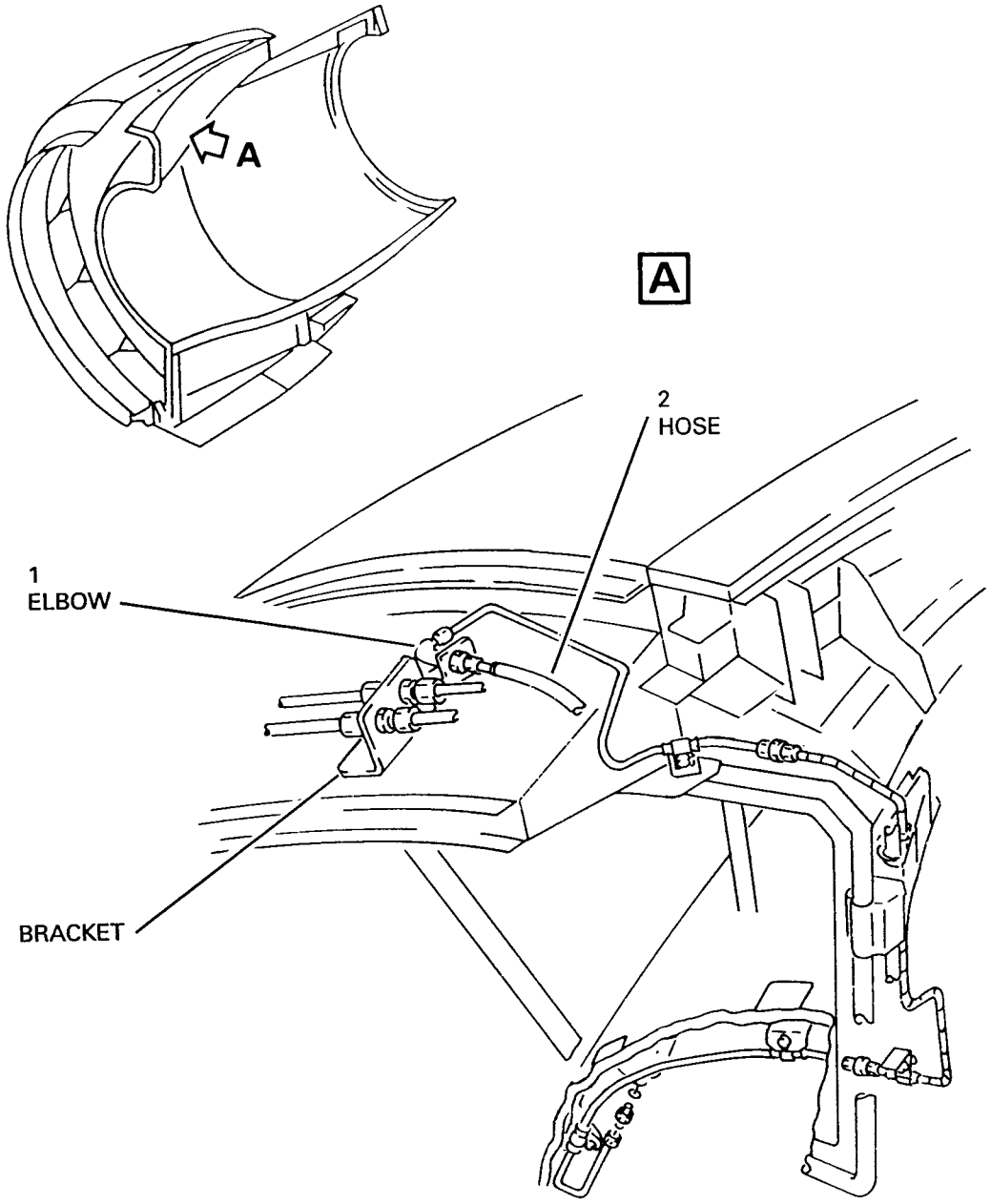
BM5 71 13 03 4 KLMA - 00

Nacelle Cooling Valve Pneumatic Tubes (LH Side)
(Sheet 1/2)
Figure 406



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Nacelle Cooling Valve Pneumatic Tubes (RH Side)
(Sheet 2/2)
Figure 406

FAN THRUST REVERSER COWL - ADJUSTMENT/TEST

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
R B.	Push-Pull Gage (Model LG-100 or Equivalent)
C.	Soft Clay - Type Compound
D.	Access Platform
E.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
F. Material No.P04-001	Common Greases (Ref. 70-00-00)
G. Material No.P05-143	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 78-11-01, P. Block 401	Nozzle-Engine Exhaust

2. Adjustment of Thrust Reverser Doors

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

CAUTION : IF REVERSER DOORS CANNOT BE CLOSED AND LATCHED, CHECK FOR INTERFERENCE. ANY PROBLEMS PREVENTING LATCHING MUST BE CORRECTED AT THIS TIME.

(2)Install access platform.

B. Adjustment

(Ref. Fig. 501, 502, 503)
(Ref. Fig. 504, 505, 506)
(Ref. Fig. 509, 510, 511)
(Ref. Fig. 512, 513)

(1)Close and adjust thrust reverser door bifurcation latches. (Ref. Fig. 501)

(a)Engage center bifurcation latch using closure assist device. (Ref. Fig. 502)

CAUTION : DO NOT APPLY MORE THAN 80 lbf (35.59 daN) MAXIMUM FORCE AT TIP OF ANY HANDLE OR DAMAGE TO LATCH WILL OCCUR.

(b)Engage aft latch then latch center and aft latches simultaneously.

(c)Disengage closure assist device and stow on left thrust reverser door.

(d)Engage and latch forward bifurcation latch.

(e)Release and relatch bifurcation latches one at a time. While closing each latch, check for closing force between 50 and 60 lbf (22.24 and 26.69 daN) measured with push-pull gage at tip of handle. For any latch with closing force outside of specified range, adjust as follows (Ref. Fig. 503).

1 Open latch. Turn slotted adjusting nut on latch bolt housing with 5/32-in. (3.969 mm) hex wrench to increase or decrease effective length of eye bolt.

NOTE : Increasing effective length of eye bolt decreases closing

force, and vice versa.

2 Close latch with push gage at tip of handle. Check for closing force between 50 and 60 lbf (22.24 and 26.69 daN). Repeat adjustment as necessary until this closing force is achieved.

(f) Ensure that all three bifurcation latches are latched when adjustments are complete.

(2) Check and adjust closing forces of forward circumferential latches (Ref. Fig. 504).

(a) Engage both forward circumferential latch hooks, then simultaneously close both latches.

NOTE : At this point and again after closing force adjustments, latches are engaged and latched simultaneously to avoid rotating band.

(b) Open either latch. Use push-pull gage at tip of latch handle to close the latch and observe closing force. If force is between 45 and 55 lbf (20.02 and 24.47 daN), leave latch closed and repeat the procedure on the other latch.

(c) If either latch closing force is not between 45 and 55 lbf (20.02 and 24.47 daN), adjust closing force to within that range.

1 Open and unhook the latch to be adjusted. Leave the other one closed.

2 Loosen locknut on threaded hook shank. Turn hook clockwise (screw it in) to increase, or counterclockwise (screw it out) to decrease closing force. Tighten locknut.

3 Recheck latch closing force. Repeat adjustment as necessary until closing force is between 45 and 55 lbf (20.02 and 24.47 daN).

NOTE : After adjustments, thread lengths on hooks should be equal, plus or minus 0.250 in. (6.350 mm). If not, loosen locknuts, then screw one hook in and the other out by the same number of turns until thread lengths are equal. Tighten locknuts.

(3) Check and adjust closing force and housing contact of aft circumferential latch (Ref. Fig. 505).

CAUTION : MANUAL TOGGLE LATCHES MUST BE UNLATCHED DURING THIS INITIAL ADJUSTMENT OF THE AFT CIRCUMFERENTIAL LATCH.

(a) Ensure that both manual toggle latches are open. If either is closed, insert a small rod or tool through the hole in the latch handle to press the release and open the latch.

NOTE : Manual toggle latches are near the top of the aft end of each thrust reverser door.

(b) Use push gage 0.250-in. (6.350 mm) in from the end of the aft circumferential latch handle to close the latch. Closing the latch should bring right and left latch housing faces into positive contact, and latch closing force after contact should not exceed 50 lbf (22.24 daN).

NOTE : Maximum closing force of 50 lbf (22.24 daN) is an interim value used during initial aft circumferential latch adjustment, while manual toggle latches are open. The final closing force is specified later in this adjustment procedure.

(c) If adjustment is required to bring latch housing faces into contact, or to reduce closing force to less than 50 lbf (22.24 daN), open latch and adjust as follows.

1 Remove two screws attaching adjustment access panel on right thrust reverser door. Set the panel and screws aside until reinstalled after final adjustments, later in this procedure.

2 Turn adjustment screw in latch with 7/32-in. (5.556 mm) hex wrench as necessary to achieve latch closing force of less than 50 lbf 22.24 daN) with latch housing faces in contact.

(d) Check that latch housings have continuous metal-to-metal contact from at least 0.38-in. (9.652 mm) forward of the latch hook to at least the same distance aft of the hook. If not, open doors and remove screws, plate, and shims from latch housing. Reshim as required to achieve specified contact. Install shims and plate with screws. TORQUE screws to between 12 and 15 lbf. in. (0.14 and 0.17 m.daN).

(4) Close and latch thrust reverser doors. Close bifurcation latch access doors. Proceed with latch contact and aerodynamic gap adjustments of three lower bifurcation latches according to type of latch housing adjustment hardware installed.

NOTE : Service Bulletin 78-13 directs installation of new latch housing hardware. Rectangular and radiused plates and shims are replaced by spherical plates with threaded adjustment feature.

(a) For pre-SB 78-13 latches, proceed to step (5) for adjustment.

(b) For post-SB 78-13 latches, proceed to step (8) for adjustment.

(5) Determine procedure for adjustment of latches without SB 78-13 incorporated.

(a) Measure longitudinal aerodynamic gaps at core cowls, access doors, and fairing. Open access doors and check amount of latch housing contact at three bifurcation latches. Determine at which latch faces an increase or decrease in shim thickness is required (Ref. Fig. 506).

NOTE : (Ref. Fig. 506) shows design specifications for all gaps and one mismatch as background information. Mismatch and transverse gaps are not adjustable. Longitudinal gaps at the core cowl, access doors, and fairing aft of access doors are adjustable using following procedure.

1 If at least 50 percent contact exists at three bifurcation latch housings and longitudinal gaps are within specified range, proceed to step (9).

2 If longitudinal gap dimensions are correct and latch housing contact is less than 50 percent, proceed to step (6).

3 If latch housing contact is a minimum of 50 percent and gap dimensions are not satisfactory, proceed to step (7).

(6) Adjust thrust reverser door latches at centerline for satisfactory latch housing contact when gap dimensions are correct (Ref. Fig. 507).

(a) Open thrust reverser doors (Ref. 71-13-00, P. Block 301).

(b) On center and aft bifurcation latch housings, install or remove shims under plates as determined necessary in step (5) (a). TORQUE screws to between 12 and 15 lbf. in. (0.14 and 0.17 m.daN).

(c) On forward bifurcation latch housing, install or remove shims under radiused pads as determined necessary in step (5) (a). Tighten screws fingertight only, for later alignment.

(d) Close and latch thrust reverser doors, and align radiused pads with each other.

(e) Using a non-permanent marker, draw a line from the side of the radiused pads onto the latch housing to mark the aligned position of the pads.

(f) Ensure that longitudinal gaps, (Ref. Fig. 506) are still maintained and that at least 50 percent contact is achieved at the three bifurca-

tion latch housings. If required, repeat steps (6) (a) through (6) (f).

(g)Verify that closing force of each bifurcation latch is still between 50 and 60 lbf. (22.24 and 26.69 daN), measured at the tips of the handles. If required, repeat step (1) (e).

(h)Verify that closing forces of the forward circumferential latches are still between 45 and 55 lbf. (20.02 and 22.44 daN) measured at the tips of the handles. If required, repeat step (2) (c).

R (j)Partially open thrust reverser doors. Align marker lines on radiused pads and latch housings. TORQUE screws to between 12 and 15 lbf. in. (0.14 and 0.17 m.daN). Proceed to step (9).

(7)Adjust thrust reverser doors for correct longitudinal gaps when a minimum of 50 percent contact exists at all bifurcation latch housings. (Ref. Fig. 506, 507)

(a)Open thrust reverser doors and remove screws attaching plates and shims on three bifurcation latches. Note positon for reinstallation.

(b)Close reverser doors and adjust the latch bolt adjusting nut at each bifurcation latch to bring the reverser halves together until they meet the longitudinal gap requirements (Ref. Fig. 506).

(c)Measure gaps at the three bifurcation latch housing faces to determine shim requirements.

(d)Open thrust reverser doors.

(e)On center and aft latch housings, install shims under plates as determined necessary in step (7) (c). TORQUE screws to between 12 and 15 lbf. in. (0.14 and 0.17 m.daN).

(f)On forward latch housing, install shims under radiused pads as determined necessary in step (7) (c). Tighten screws fingertight only, for later alignment.

(g)Close and latch reverser doors and align radiused pads with each other.

(h)Using a non-permanent marker, draw a line from the side of the radiused pads onto the latch housings to mark the aligned position of the pads.

R (j)Ensure that longitudinal gaps, (Ref. Fig. 506) are satisfactory and that at least 50 percent contact exists at each bifurcation latch housing. If required, repeat steps (7) (a) and (7) (b).

R (k)Verify that closing force at each bifurcation latch is still between 50 and 60 lbf. (22.24 and 26.69 daN) measured at the tip of the handle. If required, repeat step (1) (e).

R (l)Verify that closing forces of the forward circumferential latches are still between 45 and 55 lbf. (20.02 and 24.47 daN) measured at the tips of the handles. If required, repeat step (2) (c).

R (m)Partially open thrust reverser doors. Align marker lines on radiused pads and latch housings. TORQUE screws to between 12 and 15 lbf. in. (0.14 and 0.17 m.daN). Proceed to step (9).

(8)Adjustment procedure for post-SB 78-13 latches with spherical plates. (Ref. Fig. 506, 508)

(a)Close and latch thrust reverser doors. Close bifurcation latch access doors and proceed with aerodynamic gap measurements (Ref. Fig. 506).

NOTE : (Ref. Fig. 506) depicts design specifications for all gaps and one mismatch as background information. Mismatch and transverse gaps are not adjustable. Longitudinal gaps at the core cowl, access doors, and fairing aft of access doors are adjustable using following procedure.

1 Measure longitudinal aerodynamic gaps in lower bifurcation area. If all are within ranges of (Ref. Fig. 506), proceed to step (8) (b).

2 If one or more longitudinal gaps are not within ranges specified in (Ref. Fig. 506) determine and note at which bifurcation latch(es) the gap should be increased or decreased to improve aerodynamic smoothness.

(b) Open access doors. Leave thrust reverser doors closed and latched. Measure gaps between latch housing surfaces. Ensure gap measurements are not more than 0.31 - 0.43 in. (7.9 - 10.9 mm) for the forward latch and a gap of 0.36 - 0.44 in. (9.14 - 11.18 mm) for the center and aft latches between thrust reverser doors, fore and aft of each latch. (Ref. Fig. 508).

(c) If both aerodynamic gaps (step (8) (a)) and latch housing gaps (step (8) (b)) are within specified ranges, proceed to step (9).

(d) Adjust spherical plates to increase or decrease latch housing gaps as necessary. Adjustments are made with doors closed and latched (access doors open) by turning spherical plates with open-end wrench not exceeding 0.125-in. (3.175 mm) thickness.

NOTE : Adding or removing shims between spherical plates and latch housings in following steps affects both latch housing gaps and longitudinal aerodynamic gaps. Do not exceed maximum or minimum limits of latch housing gap range in attempting to meet aerodynamic gaps.

1 To increase latch housing gaps, proceed as follows :

NOTE : It is acceptable to use up to two shims between the shear pin and the latch housing for installation of the left hand and right hand thrust reverser doors (pre-SN 0720001).
If a left hand thrust reverser door (pre-SN 0720001) is installed with a right hand thrust reverser door (post-SN 0720001), it is also acceptable to use up to two shims between the sheer pin and the latch housing.

- Open right door. Use wrench to loosen or remove desired spherical plates. Remove laminated washer shims from between plates and latch housing surfaces. Reinstall spherical plates, without shims, to approximate previous depth in housings.
- Close doors and latch bifurcation latches. Use wrench (0.125-in. (3.175 mm) max thickness) to turn plates and adjust gaps as required.

NOTE : When increasing gaps, it may be necessary to decrease latch closing force adjustment to avoid excessive strain. See step (1) (e).

- With correct gaps, measure space between back of plates and latch housing surfaces to determine shim thickness required.
- Open right door. Remove spherical plates and install correct thickness of laminated washer shims. Reinstall plates and TORQUE to between 65 and 75 lbf. in. (0.73 and 0.85 m.daN).
- Close and latch doors and recheck gap dimensions.

2 To decrease latch housing gaps, proceed as follows :

- Open right door. Use wrench to loosen or remove spherical plates where shim thickness is to be decreased.

- Remove same thickness of washer shim laminations as desired decrease in gap. RETORQUE plates to between 65 and 75 lbf. in. (0.73 and 0.85 m.daN).
- Close and latch doors and recheck gap dimensions.

(e)Recheck bifurcation latch closing forces and readjust as necessary to between 50 and 60 lbf. (22.24 and 26.69 daN).

(9)Adjustment of deflection limiters, toggle pins, and load share seals.

(a)Open thrust reverser doors and install a soft clay-type compound on all upper and lower bifurcation deflection limiter pads (Ref. Fig. 509).

(b)Install clay with Material No.P05-143 in a minimum of five equally spaced places on the titanium seal attached to the aft frame of each thrust reverser door (Ref. Fig. 510).

NOTE : Visually verify thrust reverser upper latch toggle pin extends approximately 90 degrees perpendicular to inner aft barrel contour. With thrust reverser doors open, latch should sit flush to external contour.

(c)Move tension strap radially around top of nozzle until it contacts stop on either side. Measure the opposite side gap and divide by two to determine width of filler material needed. Move strap until gaps are equal at both ends. Insert temporary filler material between stop and end of strap on one side only.

NOTE : Make filler from small piece of aluminum or steel.

(d)Close reverser doors and latch.

(e)Adjust toggle pins (Ref. Fig. 511).

1 On side with filler between strap and stop, use push gage at tip of handle to check closing force required to overcenter toggle pin in its receptacle at the end of the strap. If closing force is between 30 and
R 50 lbf (13.34 and 22.24 daN), no adjustment is required. Leave latch closed and repeat closing force measurement on the other toggle latch.

NOTE : Overcentering of toggle pin is indicated by sudden relaxation of closing force on handle and a distinct sound.

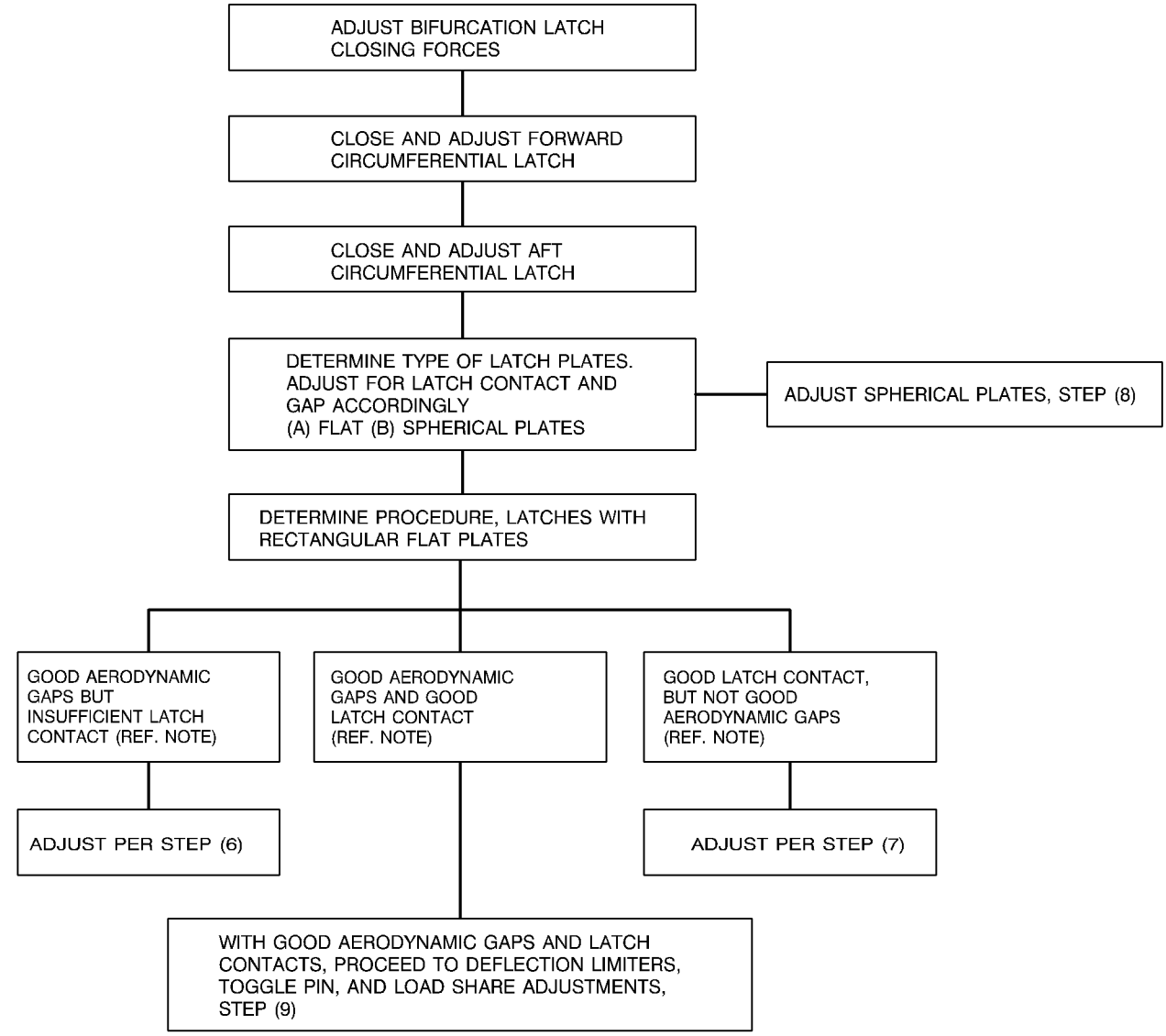
2 If either toggle latch closing force is not between 30 and 50 lbf. (13.52 and 22.54 daN), adjust by changing effective length of toggle pin. Increasing effective length increases closing force, and vice versa.

- Open toggle latch. Remove lockwire between toggle pin and jamnut, and loosen jamnut.
- Rotate toggle pin (screw it in or out) to change effective length. Close latch and recheck closing force. Repeat until force is between
R 30 and 50 lbf. (13.34 and 22.24 daN).

CAUTION : AFTER TOGGLE LATCH IS ADJUSTED WITHIN SPECIFIED CLOSING FORCE RANGE, DO NOT FURTHER ROTATE TOGGLE PIN DURING LOCKWIRING. LOSS OF ADJUSTMENT COULD RESULT IN INADEQUATE COWL LOADSHARE, POSSIBLY CAUSING FAN OR TURBINE BLADE RUB AND LOSS OF ENGINE EFFICIENCY.

- Open latch, hold toggle pin in position, and carefully tighten jamnut. Lockwire toggle pin to jamnut without rotating pin. Recheck for proper closing force after lockwiring, observing that pin goes overcenter by sound and relaxation of force.

3 Open thrust reverser door on side with filler between strap and stop. Remove filler. Close door and close toggle latch.


ADJUST BIFURCATION LATCH CLOSING FORCES
CLOSE AND ADJUST FORWARD CIRCUMFERENTIAL LATCH
CLOSE AND ADJUST AFT CIRCUMFERENTIAL LATCH
DETERMINE TYPE OF LATCH PLATES. ADJUST FOR LATCH CONTACT AND GAP ACCORDINGLY (A) FLAT (B) SPHERICAL PLATES
ADJUST SPHERICAL PLATES, STEP (8)
DETERMINE PROCEDURE, LATCHES WITH RECTANGULAR FLAT PLATES
GOOD AERODYNAMIC GAPS BUT INSUFFICIENT LATCH CONTACT (REF. NOTE)
GOOD AERODYNAMIC GAPS AND GOOD LATCH CONTACT (REF. NOTE)
GOOD LATCH CONTACT, BUT NOT GOOD AERODYNAMIC GAPS (REF. NOTE)
ADJUST PER STEP (6)
ADJUST PER STEP (7)
WITH GOOD AERODYNAMIC GAPS AND LATCH CONTACTS, PROCEED TO DEFLECTION LIMITERS, TOGGLE PIN, AND LOAD SHARE ADJUSTMENTS, STEP (9)

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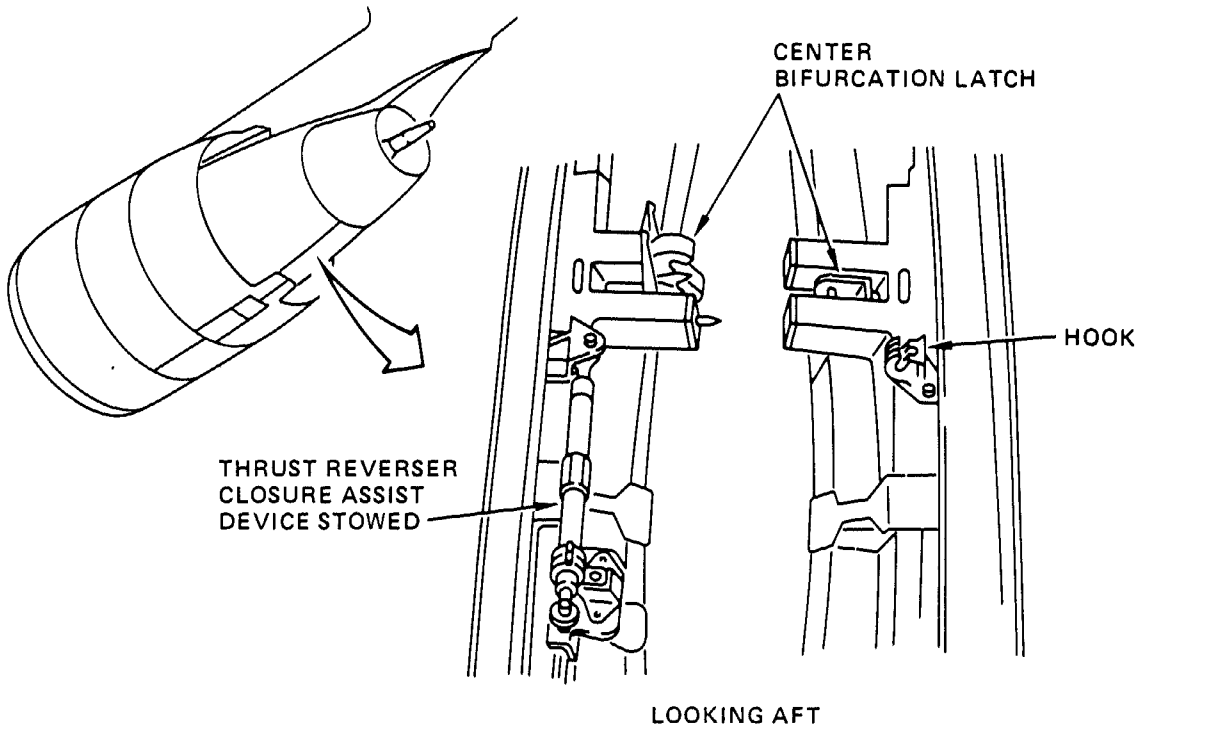
NOTE: FOR GOOD AERODYNAMIC GAPS, REFER TO FIGURE: GAP AND MISMATCH REQUIREMENTS.

Thrust Reverser Door Latch Adjustment Sequence
Figure 501



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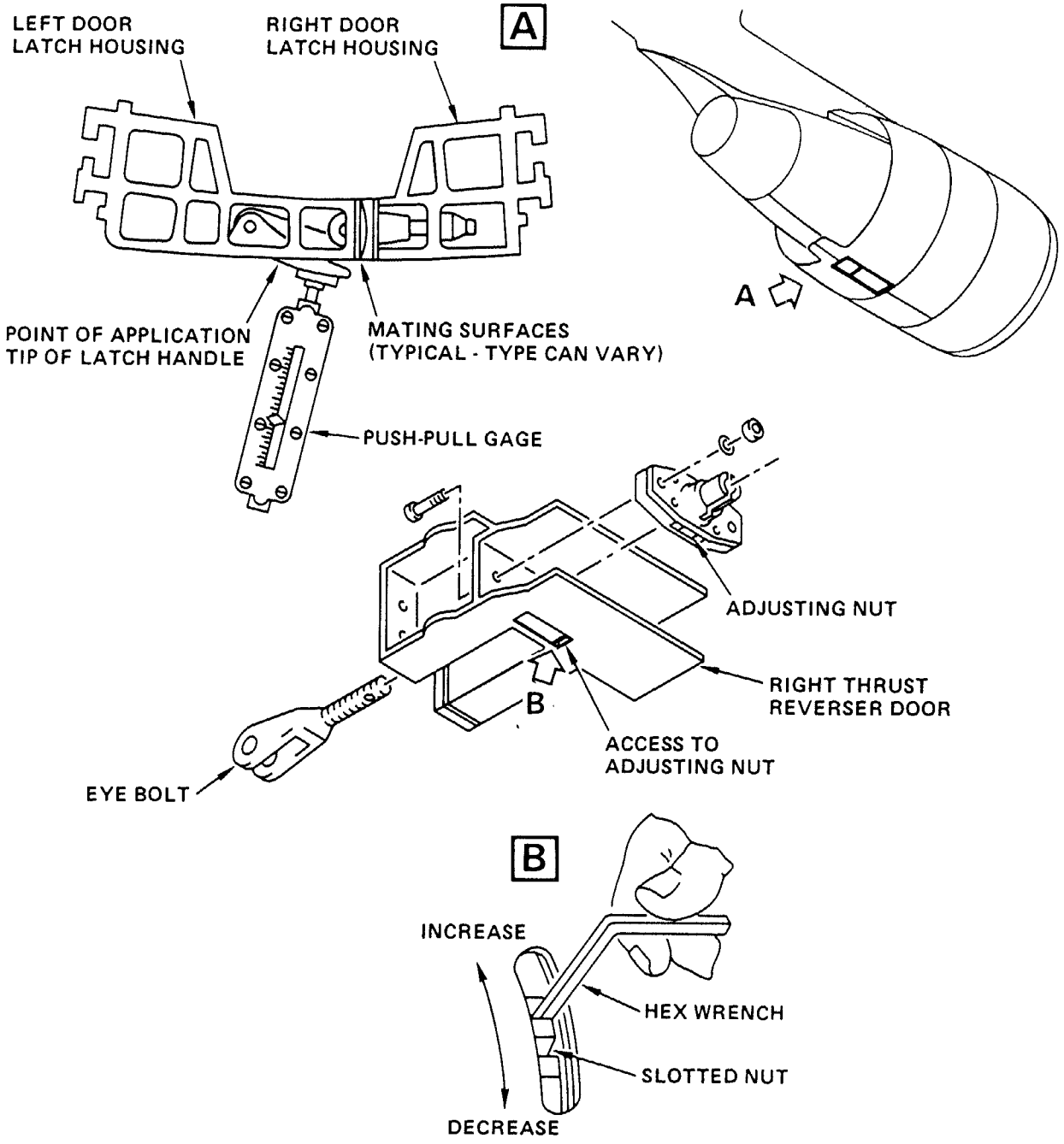
Door Closure Assist Device
Figure 502



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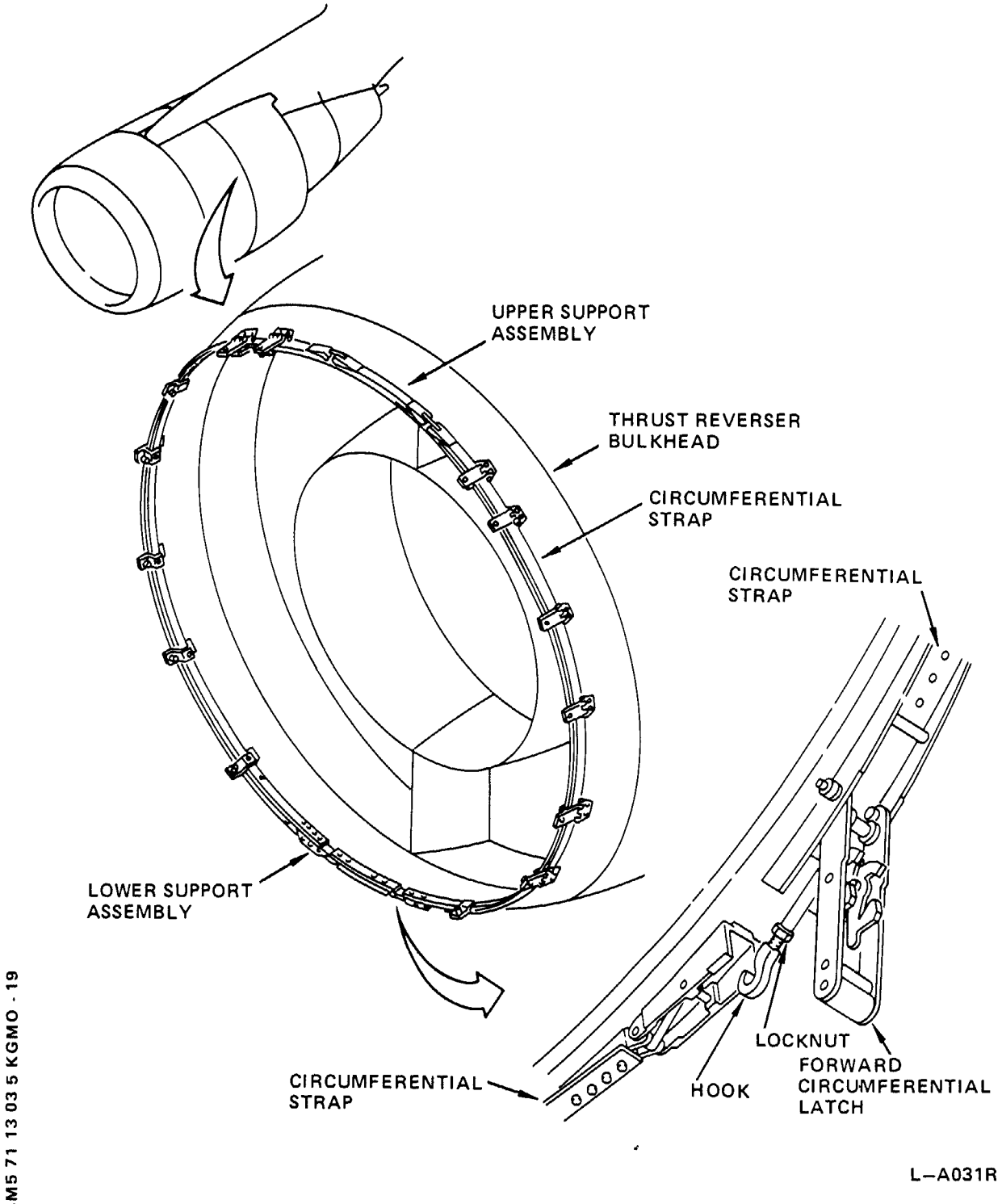
Bifurcation Latch Closing Force Adjustment
Figure 503



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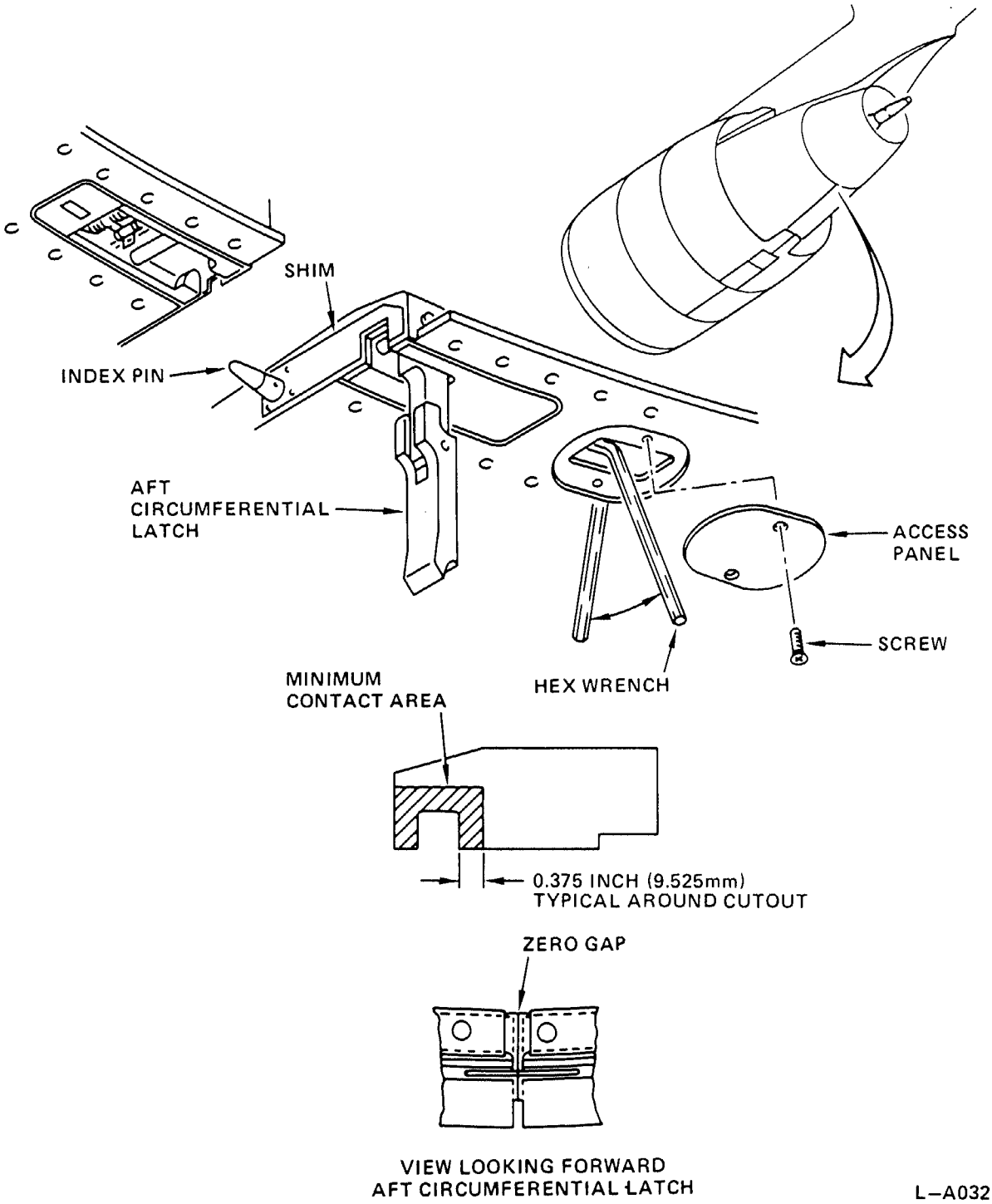
Forward Circumferential Latch
Figure 504



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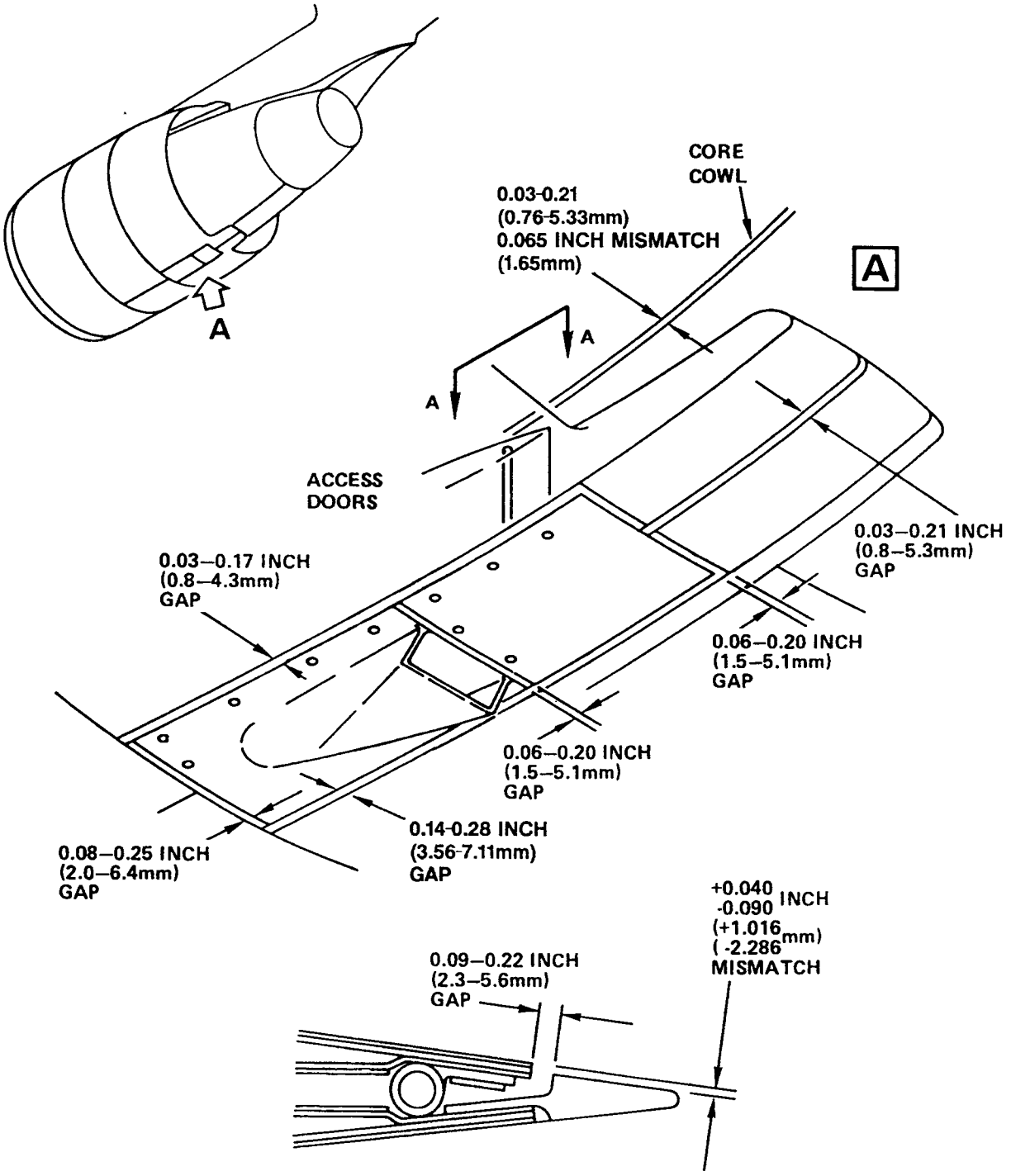
Aft Circumferential Latch
Figure 505



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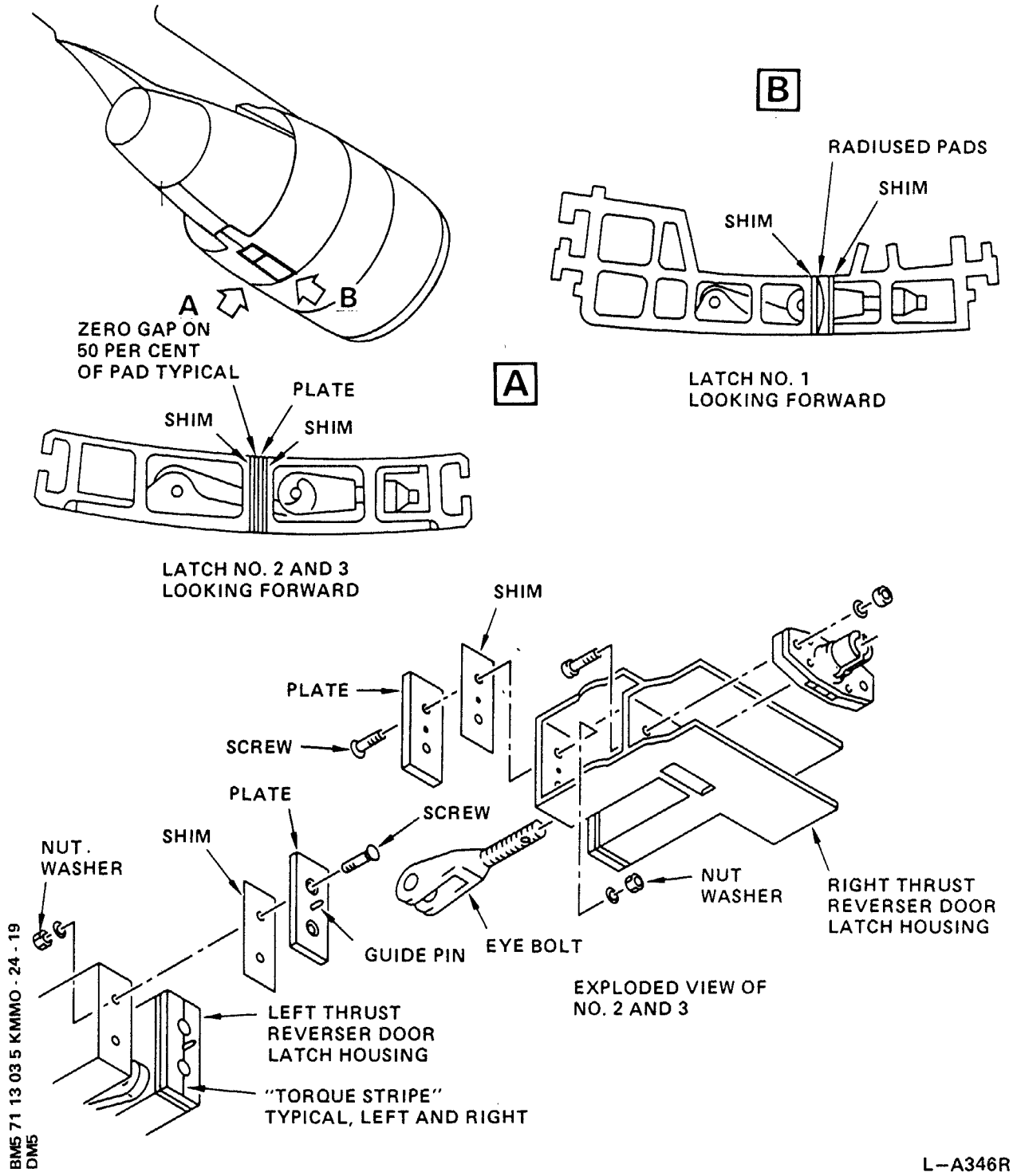
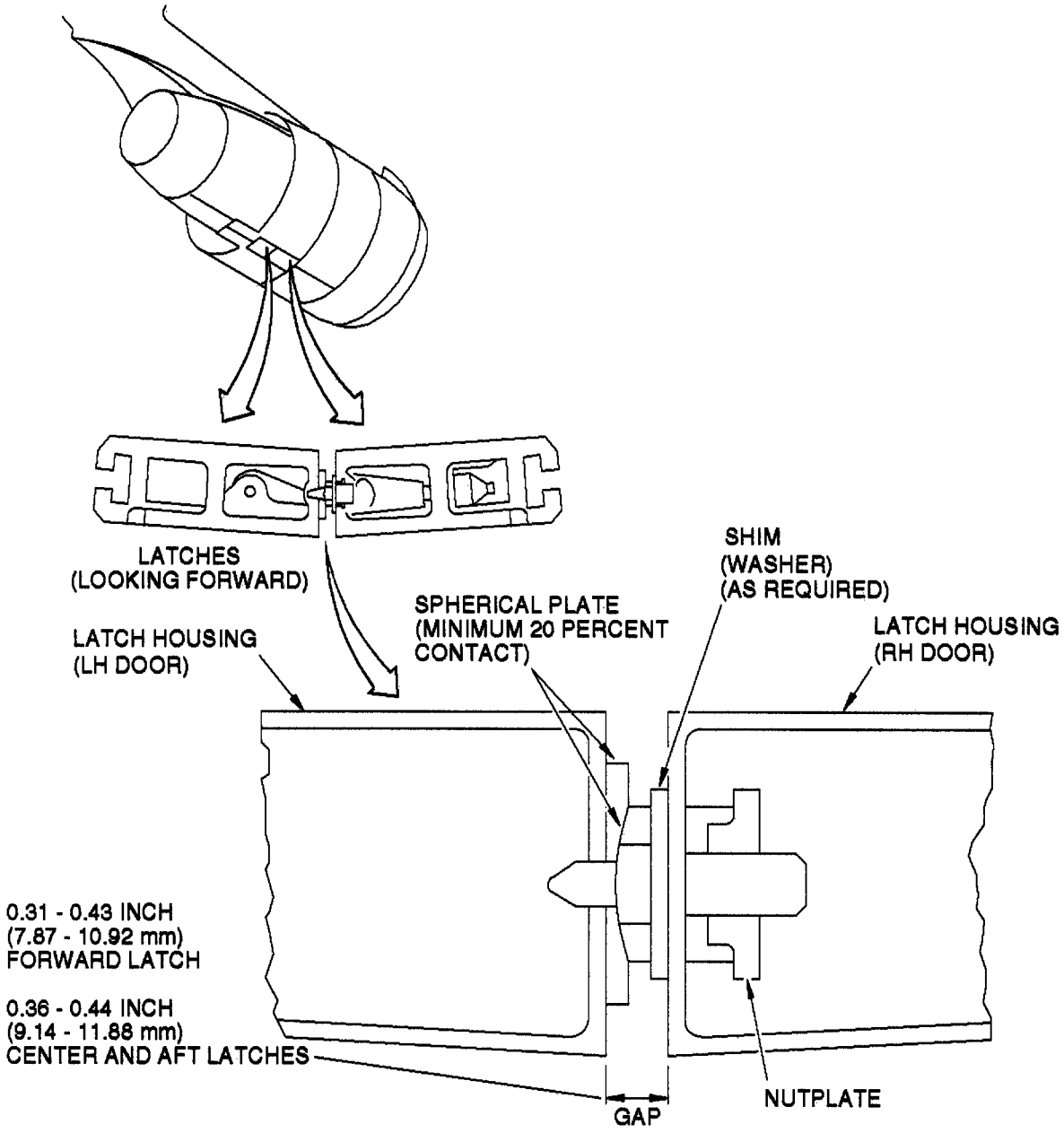
Gap and Mismatch Requirements
Figure 506



Gap Adjustments (Pre SB PW4NAC 78-13)
Figure 507



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Gap Adjustments (Post SB PW4NAC 78-13)
Figure 508

R

(f)Adjust aft circumferential latch to final closing force of between 70 and 80 lbf (31.14 and 35.58 daN).
1 Ensure that toggle latches are both closed.
2 Use push-pull gage 0.250-in. (6.35 mm) in from end of handle to close latch. If closing force is not between 70 and 80 lbf (31.14 and 35.58 m.daN), open latch and turn adjustment screw with 7/32-in. (5.556 mm) hex wrench as necessary to achieve this force.
3 Reinstall adjustment access panel that was removed from right thrust reverser door during initial closing force adjustment.
(g)Check upper and lower deflection limiter gaps (Ref. Fig. 512).
1 Adjust shim thickness to obtain a gap shown in (Ref. Fig. 512)
2 Attach shims and pads with screws. TORQUE screw to between 12 and 15 lbf.in. (0.13 and 0.17 m.daN).
(h)Check loadshare gaps between thrust reverser doors and nozzle T-ring (Ref. Fig. 513).
1 Measure compressed thickness of clay installed in step (9) (b) between titanium strap and nozzle T-ring. If thickness is within gap limits of (Ref. Fig. 513), no shimming is required. Proceed to step (10).
2 If gaps are not correct, remove rivets to loosen titanium strap(s) on reverser door frame(s). Install shims between strap and frame as required. Use tape to hold shims in place. Reshape or replace soft clay compound. See step (9) (b).
NOTE : Shims should be applied approximately evenly to both left and right hand thrust reversers to ensure split line is vertical. If clay thickness measurements indicates that one thrust reverser half needs excess shimming (more than allowable (Ref. Fig. 512) verify deflexion limiter shimming on both doors is within specified limits.
Any deflection limiter contact can result in clocking of thrust reverser and produce inaccurate gap measurements.
3 Close reverser doors and latch all latches.
4 Open doors and measure compressed clay thickness to verify loadshare gaps on each reverser half. Repeat steps 2, 3, and 4 as necessary until gap requirements of (Ref. Fig. 513) are met.
5 Use rivets to permanently fasten titanium strap(s) and shims to thrust reverser door frame(s).
(10)Close thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(11)Check aft circumferential latch for a closing force of 70-80 lbf (31.14 - 35.59 daN) measured 0.250 in. (6.35 mm) from end of latch handle and for sufficient latch contact (Ref. Fig. 505).
(12)Close fan cowl doors. (Ref. 71-13-00, P. Block 301).
(13)Accomplish the following checks after first low-power engine run :
(a)Operate manual toggle latches to verify that they are overcenter and
R that closing forces are between 30 and 50 lbf (13.34 and 22.24 daN).
(b)Verify that longitudinal gap dimensions are correct (Ref. Fig. 506) See paragraph (7) if adjustment is required.
(c)Open lower bifurcation latch access doors.
(d)For pre-SB 78-13 bifurcation latches (flat plate adjustments), verify minimum of 50 percent metal-to-metal contact at latch housings. See step (6) if adjustment is required.
(e)Verify metal-to-metal contact exists at least 0.38 in. (9.65 mm)

forward and aft of aft circumferential latch. See paragraph (3) if adjustment is required.

(f)Verify correct latch closing forces :

1 Lower bifurcation latches : 50-60 lbf (22.24 - 26.69 daN) measured at tip of handle. See paragraph (1) if adjustment is required.

2 Forward circumferential latch : 45-55 lbf (20.02 - 24.47 daN) measured at tip of handle with push-pull gage. See paragraph (2) if adjustment is required.

3 Aft circumferential latch : 70-80 lbf (31.14 - 35.58 m.daN) measured with push-pull gage 0.25 in. (6.35 mm) from end of handle. See paragraph (3) if adjustment is required.

(g)Latch all latches and close lower bifurcation latch access doors.

C. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

(3)Remove safety clips and tags and close circuit breakers 1JH, 2JH, 1KM, 2KM, 1KG, 3KC and 4KC.

3. "Flyback" Adjustment

CAUTION : THIS ABBREVIATED PROCEDURE MAY ONLY BE USED TO PREPARE AN AIRCRAFT FOR ONE-TIME "FLYBACK" TO A COMPLETE MAINTENANCE FACILITY, AFTER ENGINE CHANGE AT A REMOTE SITE. THE ENGINE CHANGE MUST INCLUDE TRANSFER OF THE UNDAMAGED EXHAUST NOZZLE FROM THE OLD ENGINE TO THE REPLACEMENT ENGINE, AND MUST NOT INCLUDE REPLACEMENT OF EITHER THRUST REVERSER DOOR, TO ENSURE ADEQUATE COWL LOADSHARE FOR LIMITED FLIGHT. COMPLETE ADJUSTMENT, SEE PARAGRAPH 2., ADJUSTMENT OF THRUST REVERSER DOORS, IS REQUIRED TO VERIFY FULL COWL LOADSHARE BEFORE AIRCRAFT IS RETURNED TO UNLIMITED SERVICE.
TAKEOFF WITHOUT FULL COWL LOADSHARE COULD CAUSE REDUCED ENGINE EFFICIENCY DUE TO EXCESSIVE WEAR OF FAN BLADE RUBSTRIPS AND TURBINE BLADE TIP SEALS.

A. Job Set-Up

(1)Install exhaust nozzle from engine being replaced onto replacement engine (Ref. 78-11-01, P. Block 401).

(2)Install access platform.

B. Adjustment

(Ref. Fig. 502, 503, 504)
(Ref. Fig. 505)

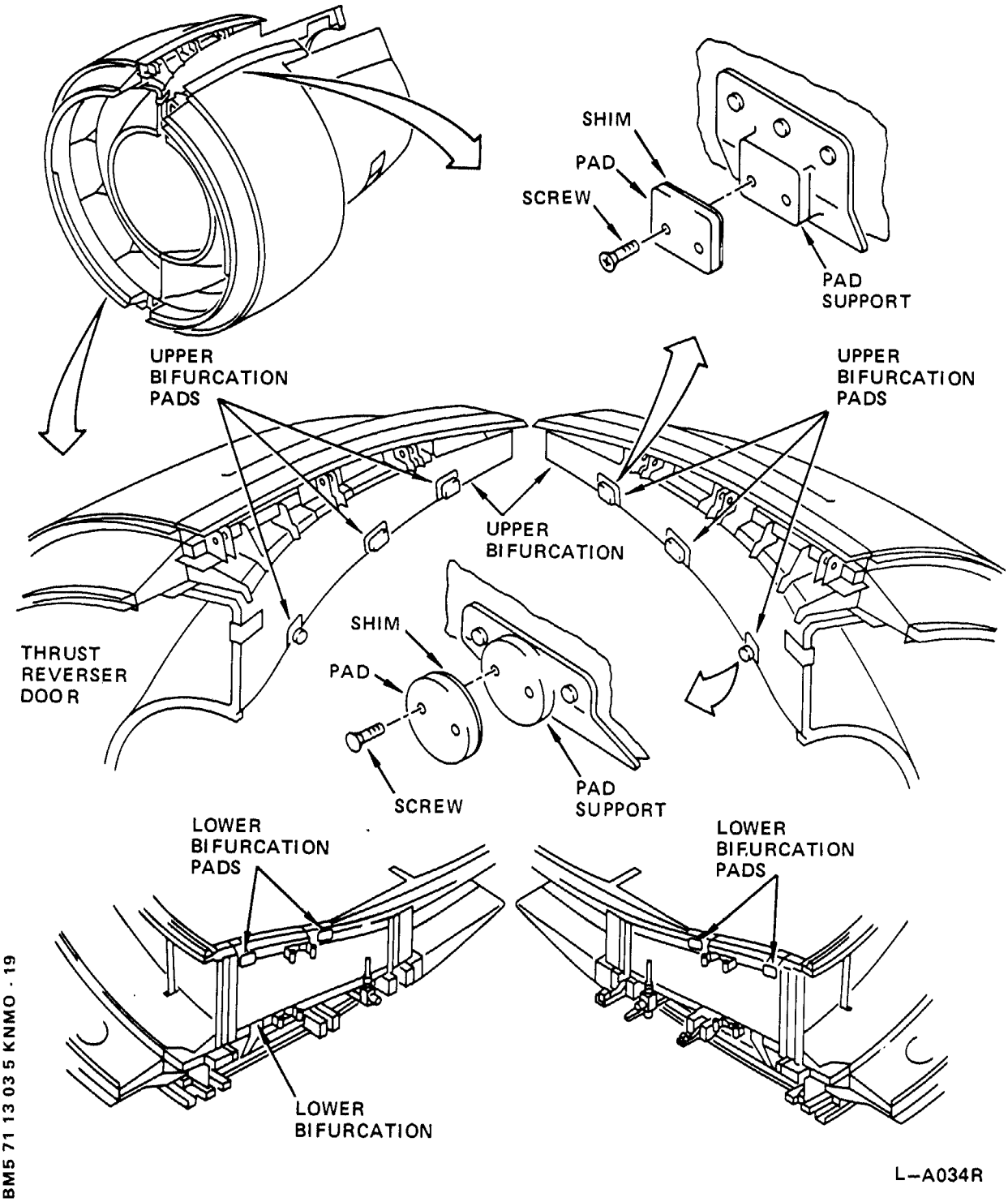
(1)Lubricate inner and outer fan case V-grooves and thrust reverser door V-blades. Use Material No.P04-001.

CAUTION : IF THE REVERSER DOORS CANNOT BE CLOSED AND LATCHED, CHECK FOR INTERFERENCE. ANY PROBLEMS PREVENTING LATCHING MUST BE CORRECTED AT THIS TIME.

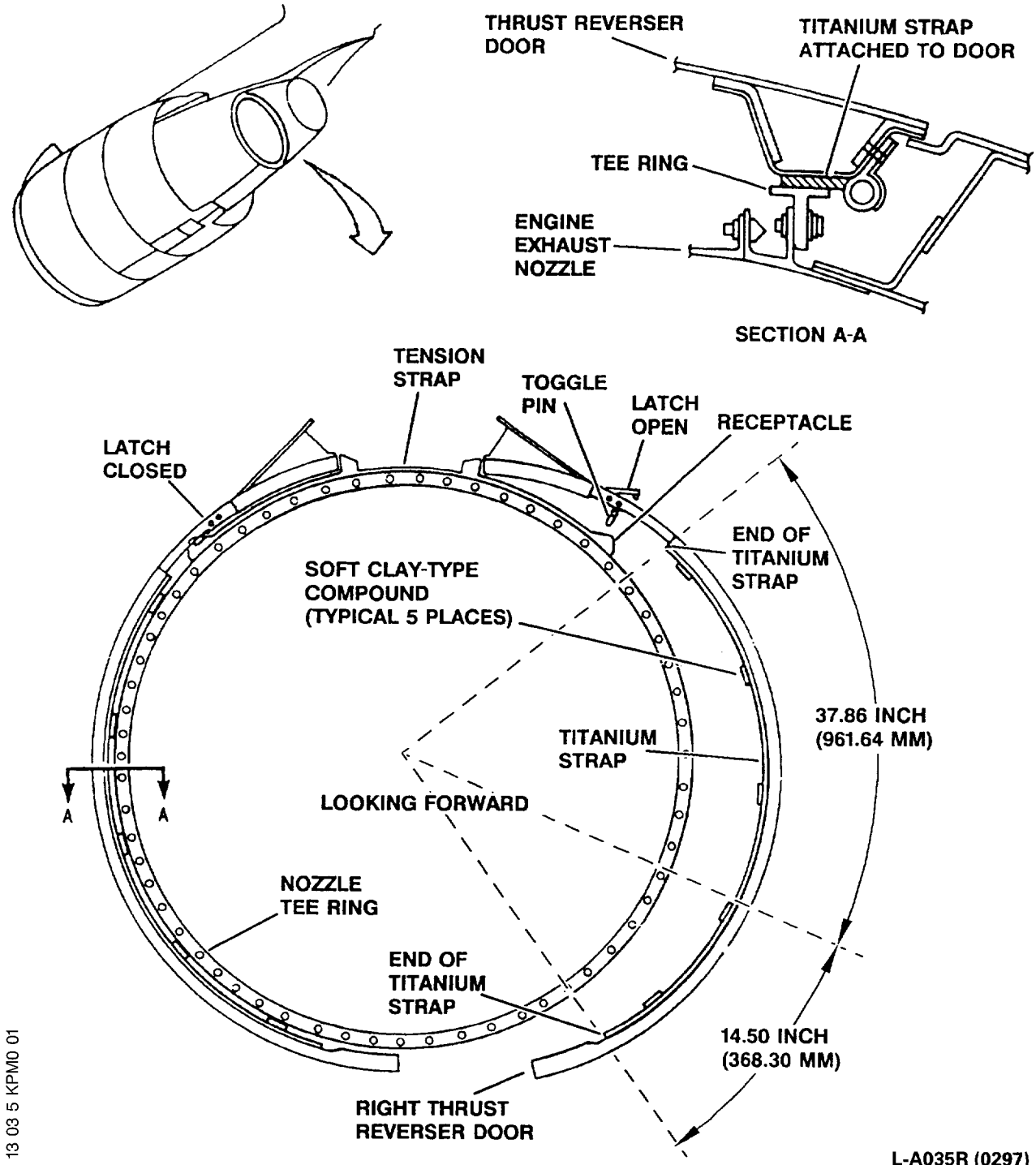
(2)Slowly close thrust reverser doors. Check for any interference, and for correct alignment of inner and outer V-blades and grooves.

(3)Check and adjust bifurcation latch closing forces.

(a)Engage center bifurcation latch using closure assist device



Upper and Lower Bifurcation Deflection Limiter Shims
Figure 509



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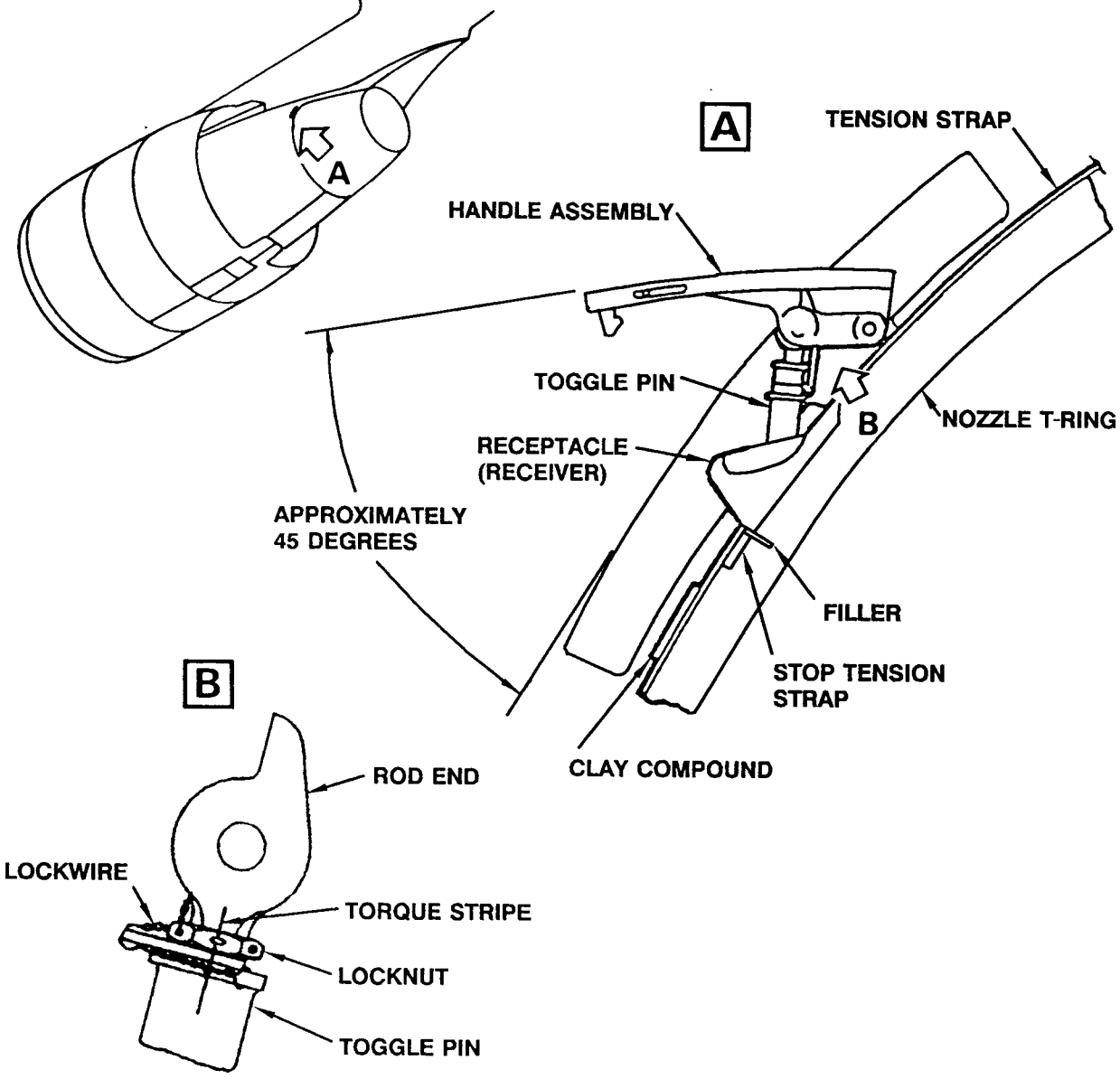
Nozzle Tension Strap Adjustment
Figure 510



METHOD OF LOCKWIRING

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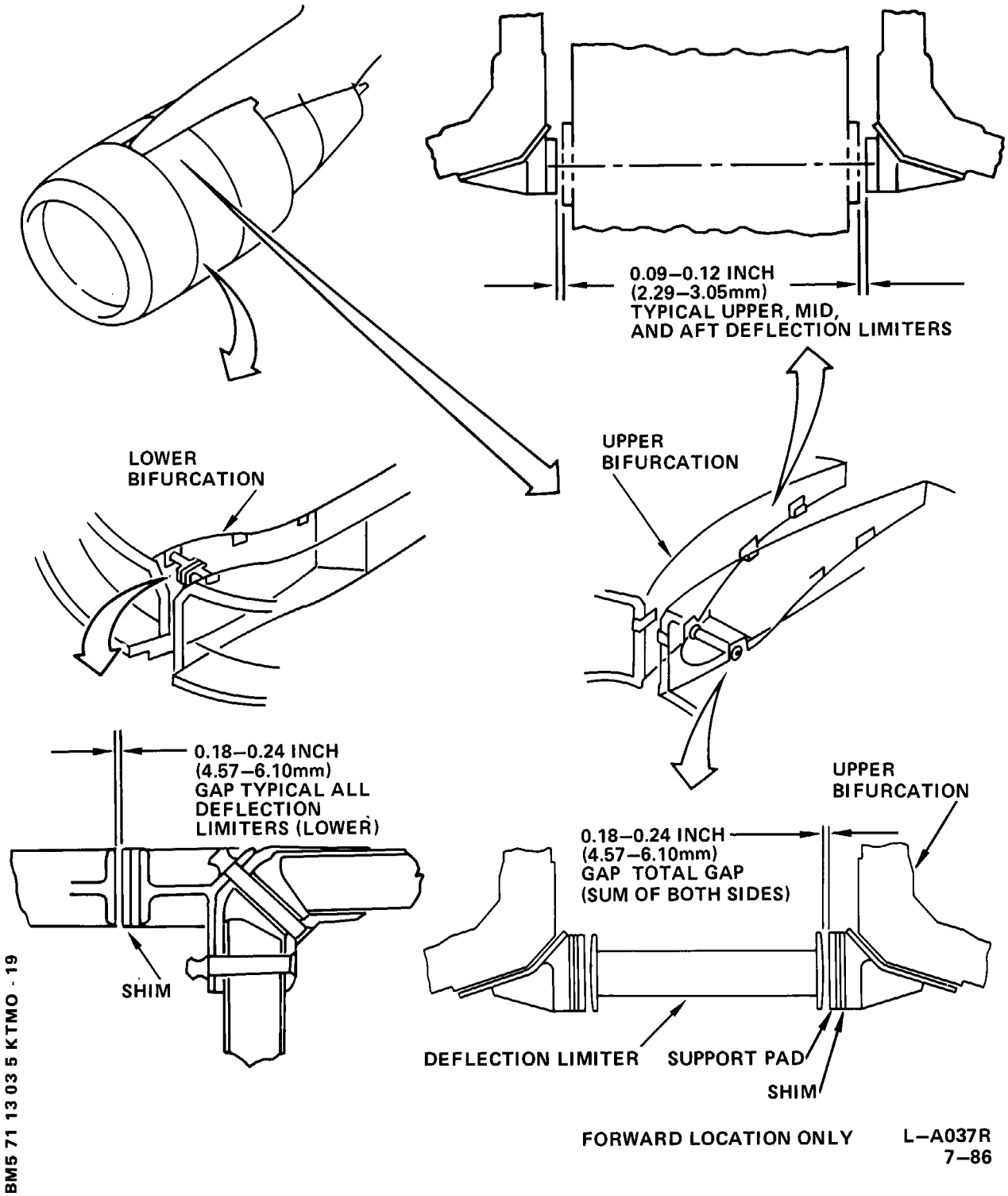
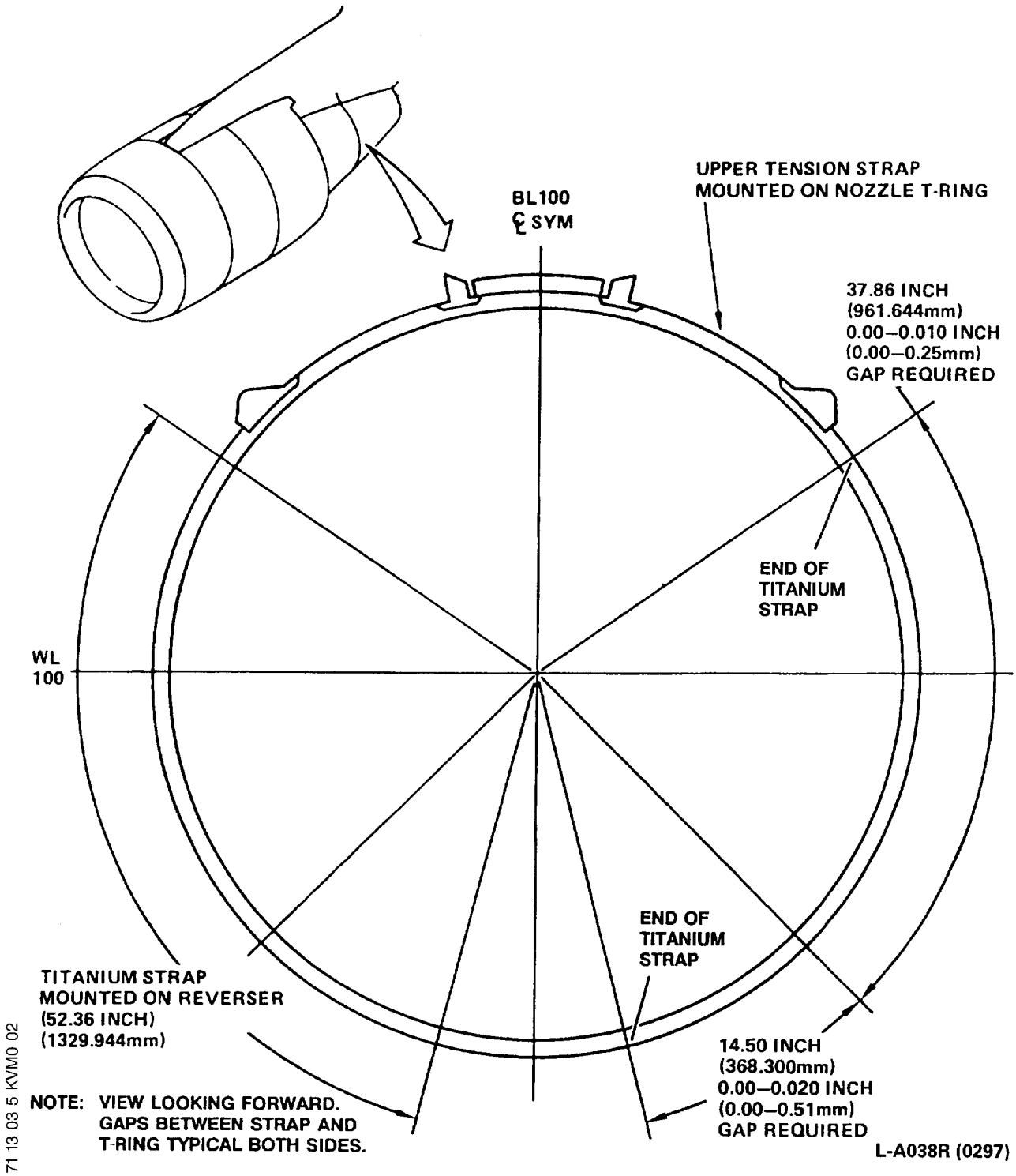
Manual Toggle Pins
Figure 511



Deflection Limiter
Figure 512



Loadshare Gaps
Figure 513

(Ref. Fig. 502).

CAUTION : DO NOT APPLY MORE THAN 80 lbf (35.59 daN) FORCE AT TIP OF ANY LATCH HANDLE. EXCESSIVE FORCE WILL DAMAGE LATCHES.

(b) Engage aft latch, then latch center and aft latches simultaneously.

(c) Disengage closure assist device and stow on left thrust reverser door.

(d) Engage and latch forward bifurcation latch.

(e) Release and relatch bifurcation latches one at a time. While closing each latch, check for closing force of between 50 and 60 lbf (22.24 and 26.69 daN) measured with push gage at the tip of the latch handle. For any latch with closing force outside of specified range, adjust as follows (Ref. Fig. 503).

1 Open latch. Turn slotted nut on latch bolt housing with 5/32-in. (3.969 mm) hex wrench to increase or decrease effective length of eye bolt.

NOTE : Increasing effective length of eye bolt decreases closing force, and vice versa.

2 Close latch with push gage at tip of handle. Check for closing force between 50 and 60 lbf (22.24 and 26.69 daN). Repeat adjustment as necessary until this closing force is obtained.

(f) (Pre-SB 78-13 latches only) With the three bifurcation latches closed, verify that right and left door latch housing faces (forward and aft of each latch) have positive contact over at least 50 percent of their surface areas. If not, remove face plates and reshim as necessary to achieve a minimum of 50 percent contact, see paragraph 2., adjustment of thrust reverser doors.

(g) Ensure that all three bifurcation latches are closed after adjustments are complete.

(4) Check and adjust forward circumferential latch closing forces (Ref. Fig. 504).

(a) Engage both forward circumferential latch hooks, then simultaneously close both latches.

NOTE : At this point, and again after closing force adjustments, latches are closed simultaneously to avoid rotating band.

(b) Open either latch. Use push gage at tip of handle to close the latch and observe closing force. If force is between 45 and 55 lbf (20.02 and 24.47 daN), leave latch closed and repeat the procedure on the other latch.

(c) If either latch closing force is not between 45 and 55 lbf (20.04 and 22.47 daN), adjust closing force to within that range.

1 Open and unhook the latch to be adjusted. Leave the other one closed.

2 Loosen locknut on threaded hook shank. Turn hook clockwise (screw it in) to increase, or counterclockwise (screw it out) to decrease closing force. Tighten locknut.

3 Recheck latch closing force. Repeat adjustment as necessary until closing force is within specifications.

(d) When both forward circumferential latches have been checked or adjusted for specified closing force, open both latches and then simultaneously close them.

(5) Adjust closing force of aft circumferential latch (Ref. Fig. 505).

(a) Operate manual toggle latches to ensure that both are closed and over-center.

(b)Use push gage 0.25-in. (6.350 mm) in from end of aft circumferential latch handle to check for closing force between 70 and 80 lbf (31.14 and 35.58 daN). If closing force is not within this range, open latch and adjust as follows.

1 Remove two screws attaching adjustment access panel on right thrust reverser door.

2 Turn adjustment screw in latch with 7/32-in. (5.556 mm) hex wrench to increase or decrease closing force. Repeat as necessary until force between 70 and 80 lbf (31.14 and 35.58 daN) is obtained.

3 Reinstall access panel on door.

4 Verify that aft circumferential latch housing faces have continuous metal-to-metal contact from at least 0.38-in. (9.652 mm) forward of the latch hook to the same distance aft of the hook. If not, reshim as required to achieve specified contact, see paragraph 2. adjustment of thrust reverser doors.

(6)Close and latch doors. Make visual check for normal door fit and smoothness at mating surfaces.

C. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

FAN THRUST REVERSER COWL - INSPECTION/CHECK

1. Inspect Thrust Reverser Door Restrictor

A. Equipment and Materials

ITEM	DESIGNATION
R (1)	Push - Pull Gage (Model LG-100 or Equivalent)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-03, P. Block 501	Fan Thrust Reverser Cowl

B. Job Set-up
(1)Open, safety and tag appropriate circuit breakers and open the thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

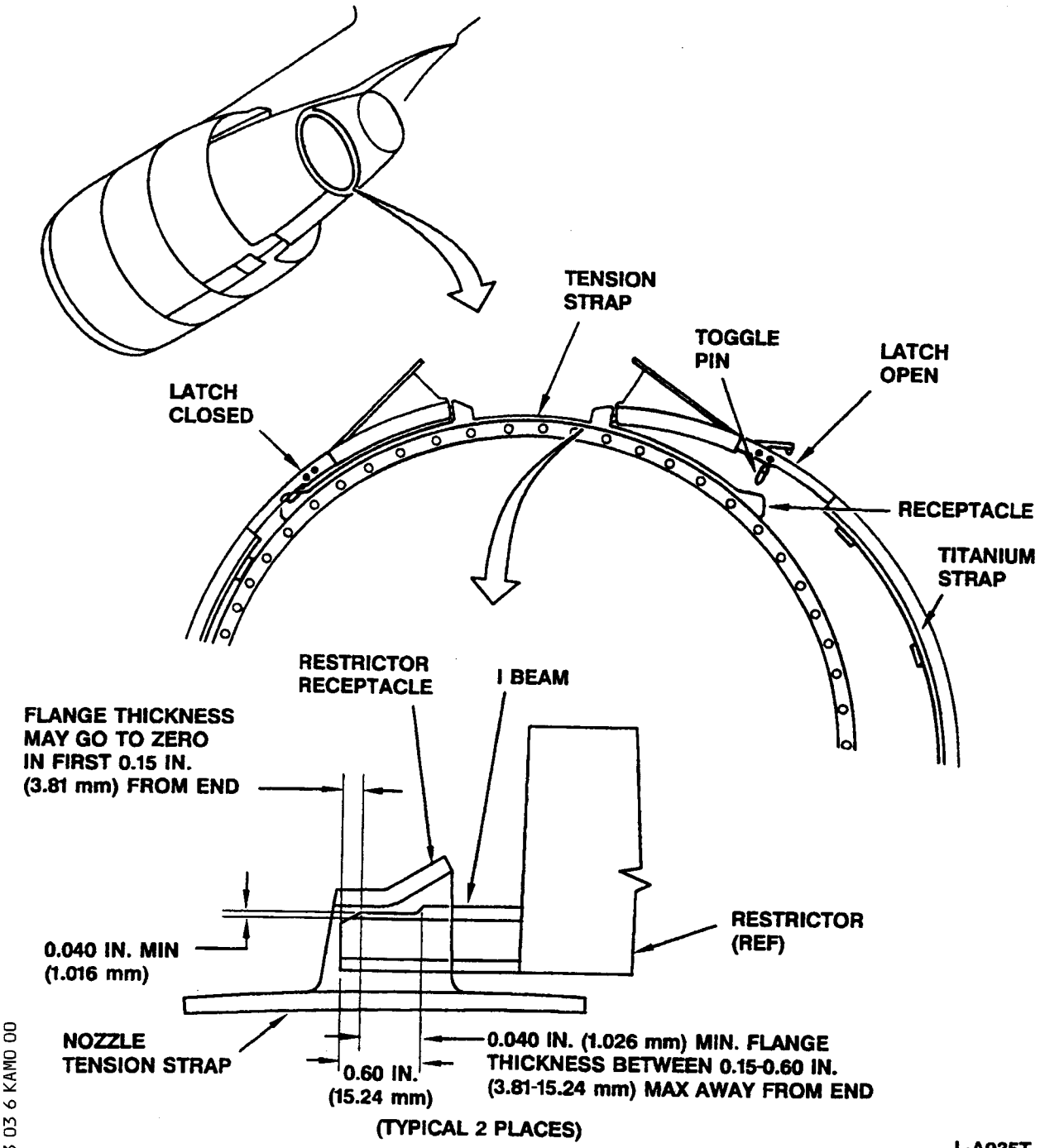
C. Procedure (Ref. Fig. 601)
(1)Inspect I-beam section of restrictor for excessive wear or damage.
NOTE : The allowable damage limits are applicable only if the following conditions are met.
(a)Verify overcenter test of toggle pin latch.
1 Use push-pull gage at tip of handle to check closing force required to overcenter toggle pin in its receptacle at the end of the strap. If closing force is between 30 and 50 lbs (135.2 and 225.4 N), no adjustment is required. Leave latch closed and repeat closing force measurement on the other toggle latch.
NOTE : Overcentering of toggle pins is indicated by sudden relaxation of closing force on handle and a distinct sound.
2 If overcenter test fails, rerig toggle latch (Ref. 71-13-03, P. Block 501).
(b)Check the amount of shim between the loadshare frame and the titanium strap. If shim exceeds 0.100 in. (2.54 mm), remove all shim under the titanium strap and rerig (Ref. 71-13-03, P. Block 501).
NOTE : Excessive shim may affect overcenter conditions of toggle latch.
(c)If all rigging conditions are met, verify allowable damage limits (Ref. Fig. 601).

D. Close-up
(1)Close the thrust reverser cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

2. Inspect Thrust Reverser Cowl Door Seals

A. Job Set-up
(1)Open, safety and tag appropriate circuit breakers and open the thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Equipment and Materials


TENSION STRAP
TOGGLE PIN
LATCH OPEN
LATCH CLOSED
RECEPTACLE
TITANIUM STRAP
RESTRICTOR RECEPTACLE
I BEAM
FLANGE THICKNESS MAY GO TO ZERO IN FIRST 0.15 IN. (3.81 mm) FROM END
RESTRICTOR (REF)
0.040 IN. MIN (1.016 mm)
NOZZLE TENSION STRAP
0.60 IN. (15.24 mm)
0.040 IN. (1.026 mm) MIN. FLANGE THICKNESS BETWEEN 0.15-0.60 IN. (3.81-15.24 mm) MAX AWAY FROM END
(TYPICAL 2 PLACES)
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Thrust Reverser Door Restrictor
Figure 601

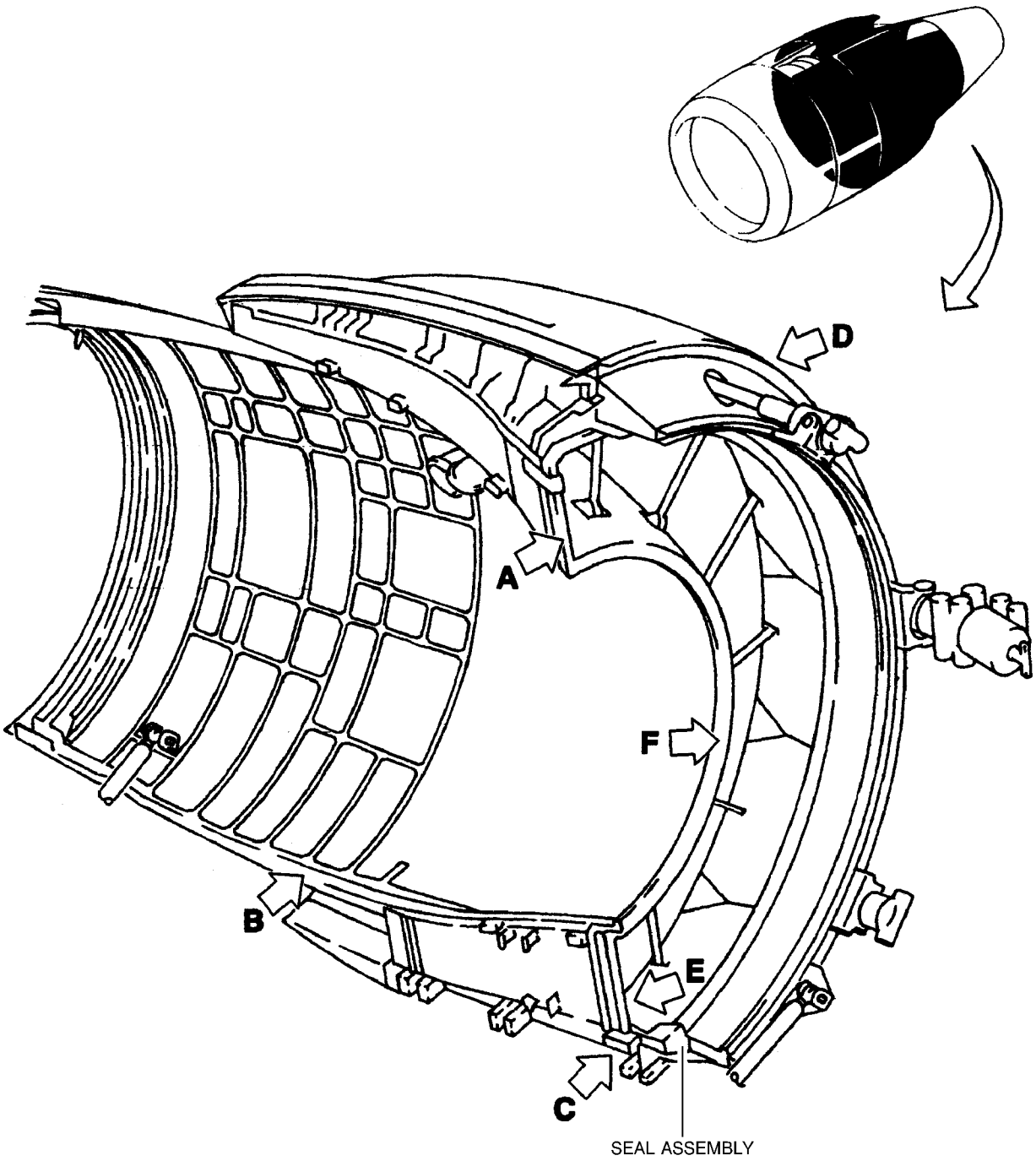
ITEM	DESIGNATION
(1)None	
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

C. Procedure

(1)Visually inspect all seals for cuts, aging, deterioration, frayed, depressed or flattened areas (Ref. Fig. 602). Replace if damaged.

D. Close-up

(1)Close the thrust reverser cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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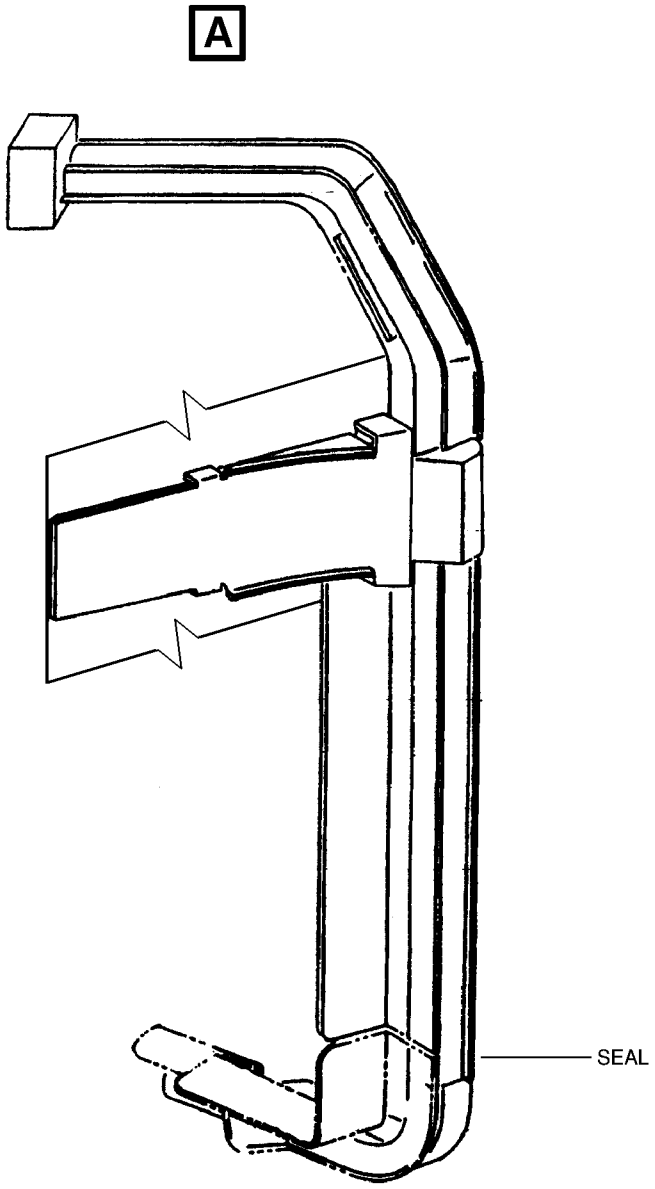
Thrust Reverser Seal Installation (Sheet 1/5)
Figure 602

R



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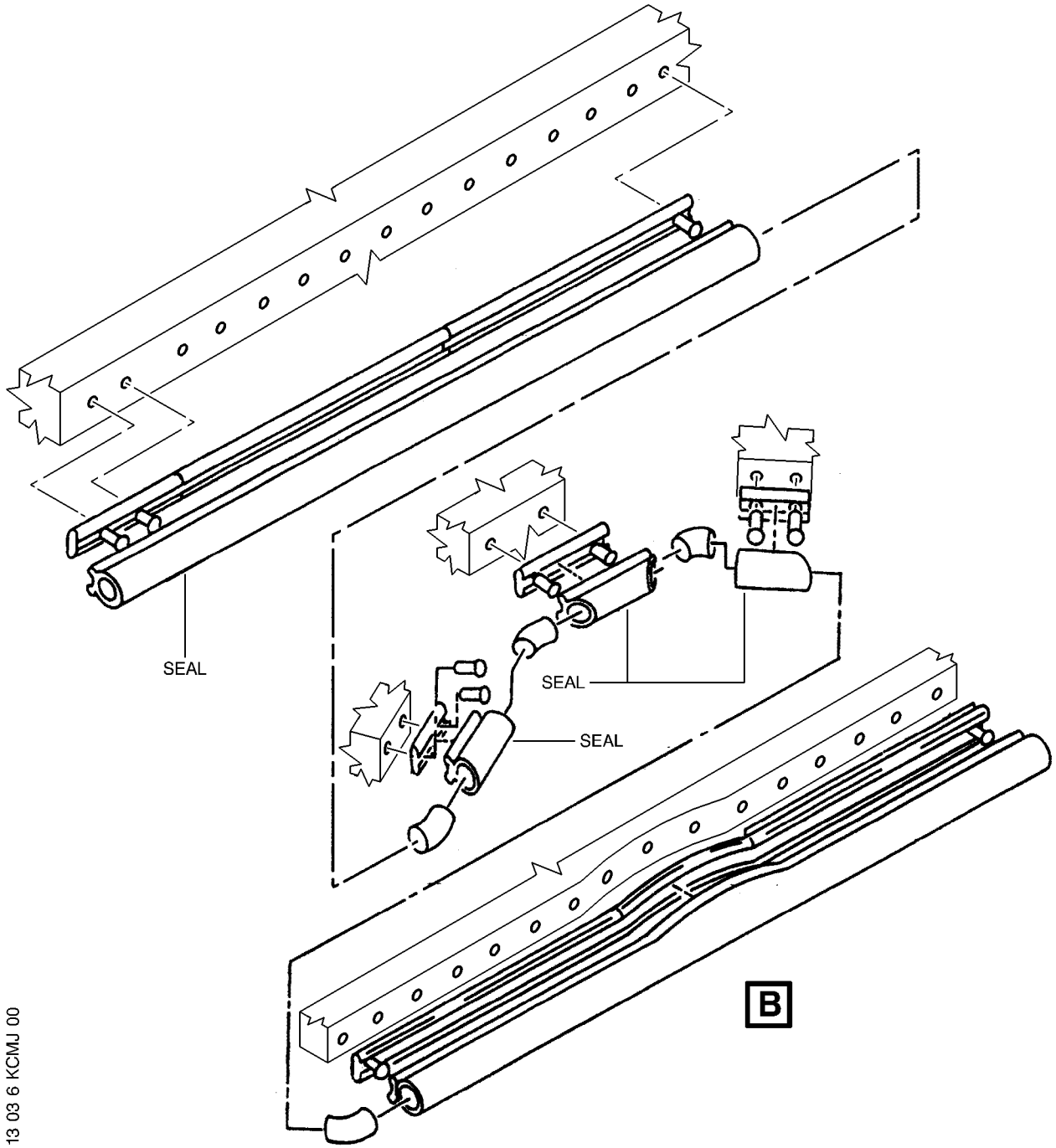
Thrust Reverser Seal Installation (Sheet 2/5)
Figure 602

R



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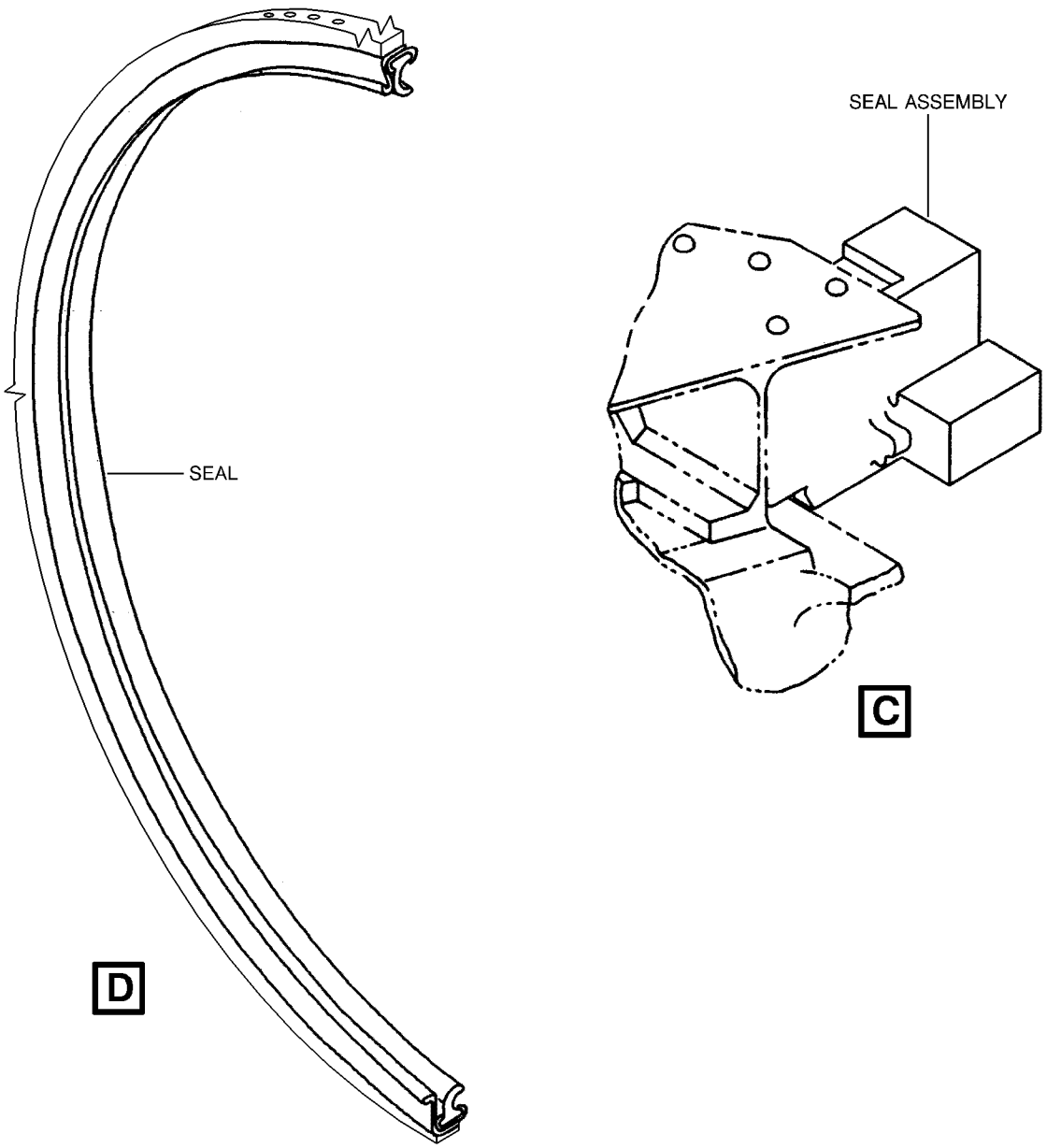
Thrust Reverser Seal Installation (Sheet 3/5)
Figure 602

R



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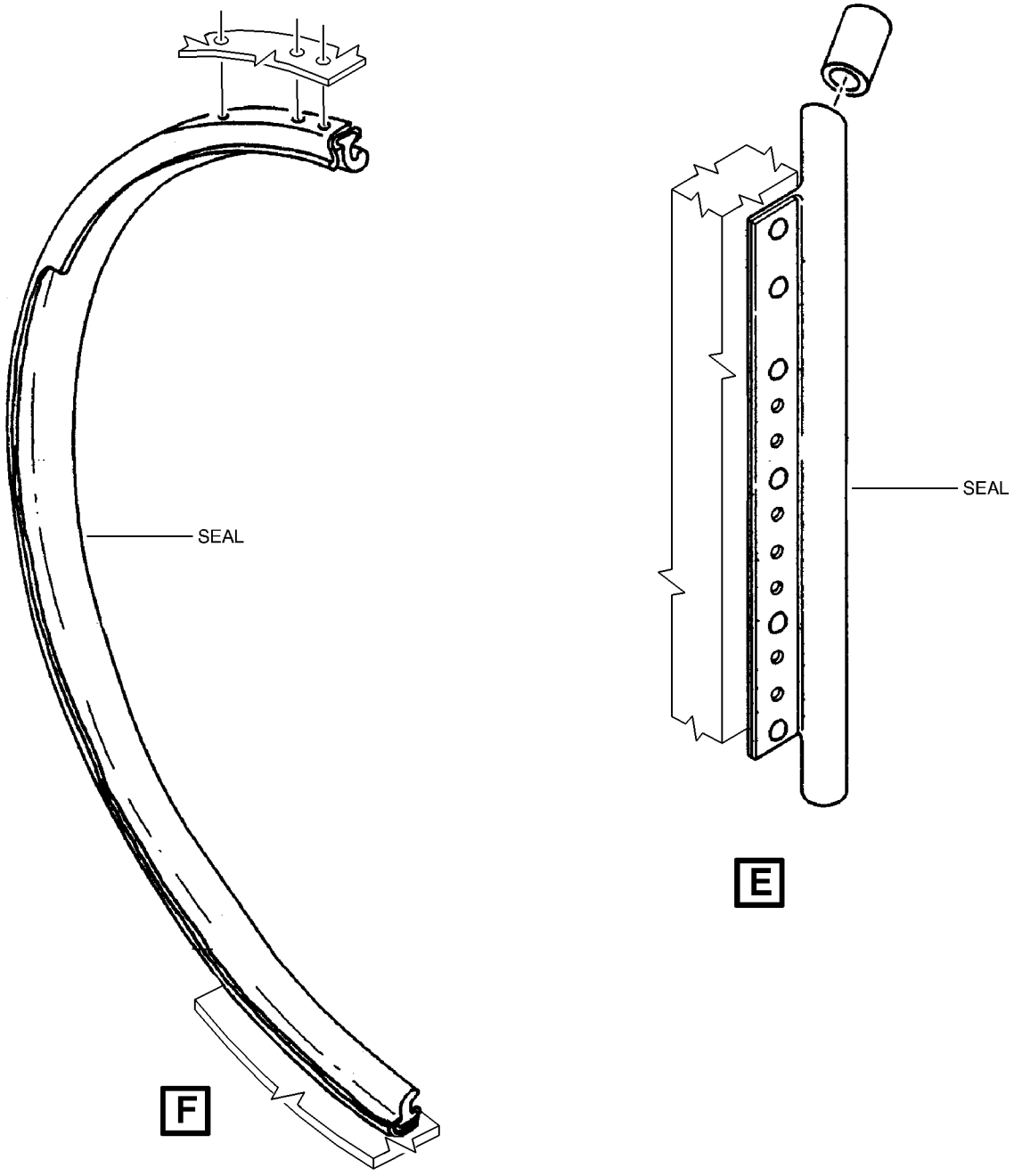
Thrust Reverser Seal Installation (Sheet 4/5)
Figure 602

R



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Thrust Reverser Seal Installation (Sheet 5/5)
Figure 602

R

FAN COWL DOOR HOLD - OPEN RODS - SERVICING

1. Equipments and Materials

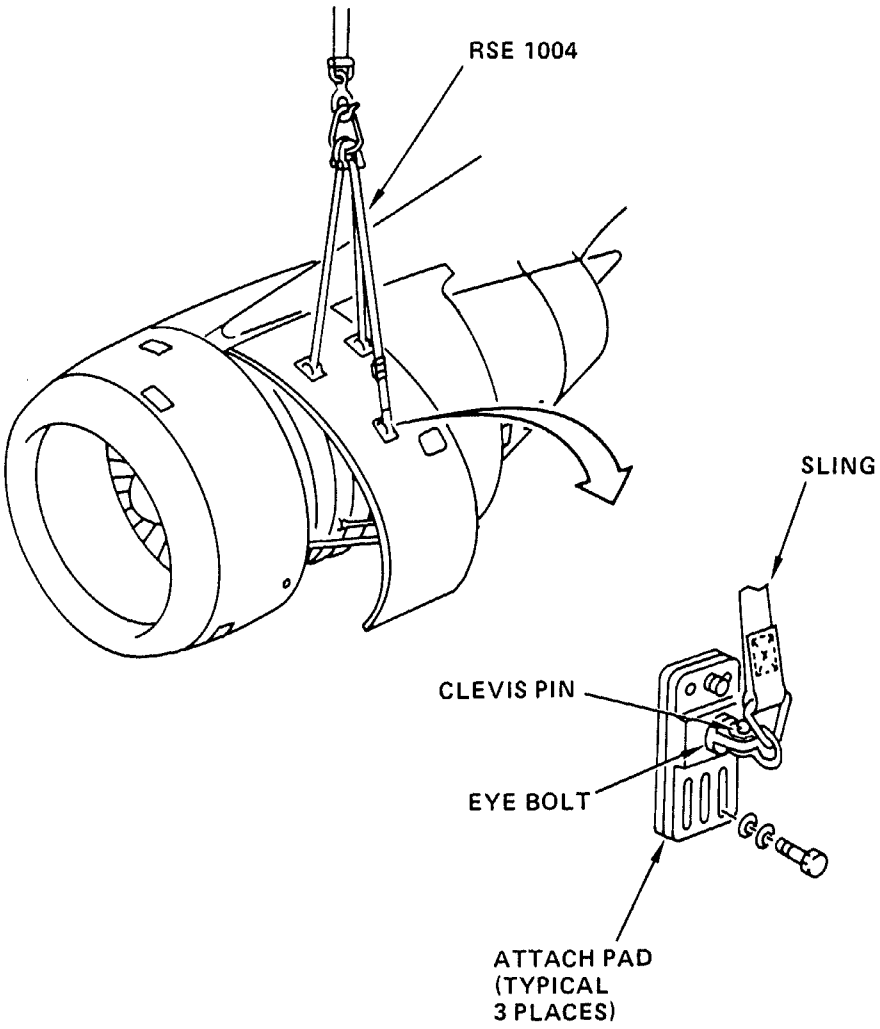
ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Attach Pad
C. RSE1004	Sling, Fan Cowl
D. Material No.P06-004	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

A. Job Set-Up
(1)Open ,safety and tag the appropriate circuit breakers and open fan cowl door (Ref. 71-13-00, P. Block 301).

B. Clean fan cowl door hold-open rods (Ref. Fig. 301).
CAUTION : DO NOT OPEN FAN COWL DOORS IF GROUND WIND VELOCITIES EXCEED 40 KNOTS. DO NOT LEAVE DOORS OPEN IF GROUND WIND VELOCITIES EXCEED 60 KNOTS. WINDS IN EXCESS OF THESE VELOCITIES WILL CAUSE OVERSTRESS AND POSSIBLE FAILURE OF DOORS, OPENING AND HOLD-OPEN DEVICES, OR ASSOCIATED HARDWARE.
(1)Remove hoist point plugs and retain for installation.
(2)Attach RSE1004 Fan Cowl Sling to hoist and position over fan cowl door to be raised.
(3)Lower sling and attach pads to fan cowl hoist point.
(4)Unlatch fan cowl door latches by pressing latch trigger to release latch handle and pull down to release tension latch.
(5)With hoist, open fan cowl door sufficiently to unlock both hold-open rods.
(6)Unlock both hold-open rods, extend and lock both telescoping sections in their extended position. (Ref. Fig. 302)
(7)Clean telescoping rod sections with a clean lint-free cloth moistened with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).
(8)Remove minor scratches, nicks, and other surface imperfections from telescoping rod sections with a crocus abrasive cloth. Repeat step (7).

C. Lubricate Fan Cowl Door Hold - Open Rods (Ref. Fig. 301, 302)
(1)Coat the extended telescoping sections of the hold-open rods with Material No. P06-004.
(2)Retract telescoping rods sections and attach hold - open rods to their retention brackets on the fan cowl doors.
(3)Lower fan cowl door until sling straps are slack remove attach pads from fan cowl hoist points. Install hoist point plugs.

E. Close-Up
(1)Close fan cowl doors , and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Bloxk 301).



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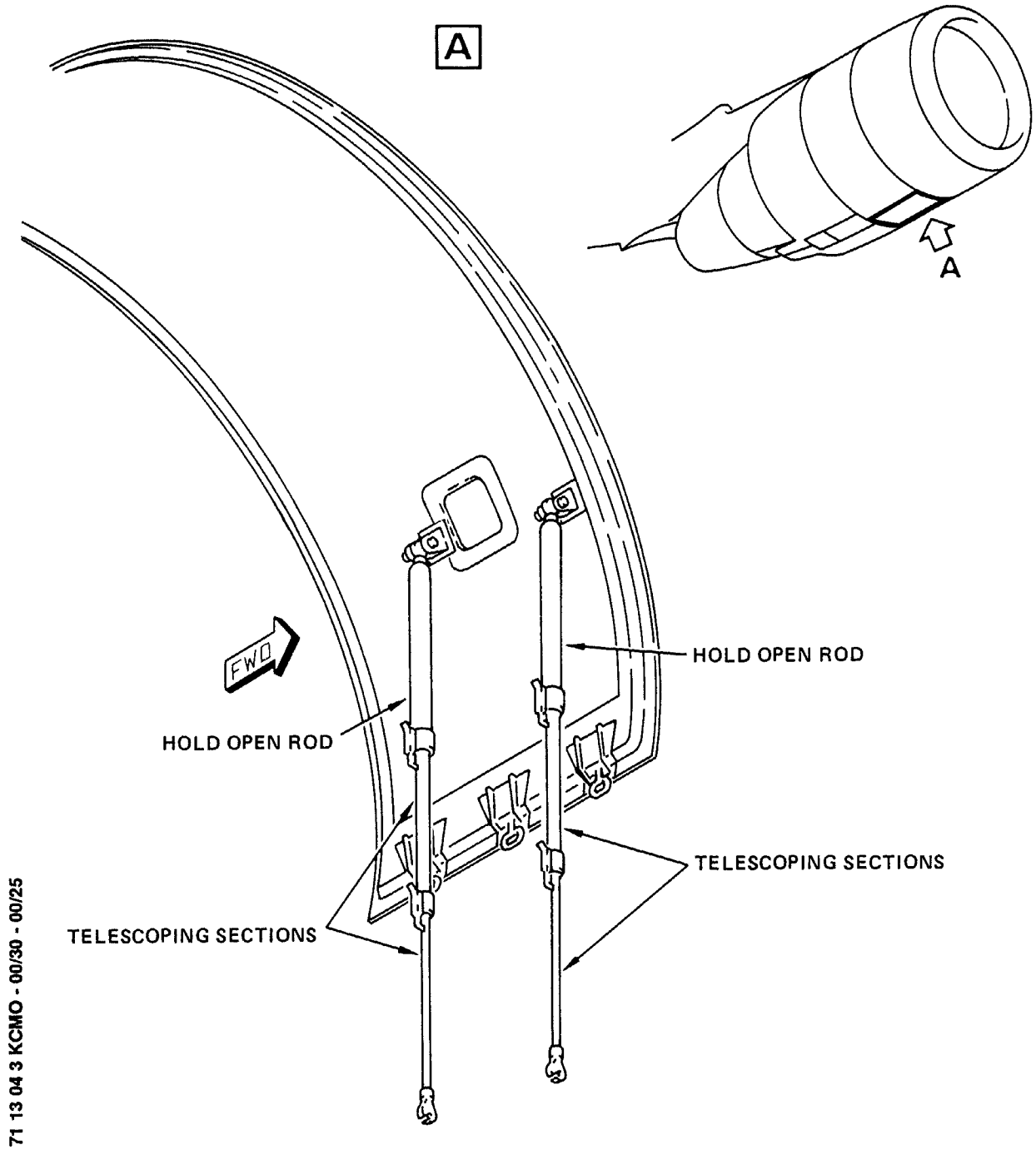
Fan Cowl Sling Installation
Figure 301



Fan Cowl Hold - Open Rods Extended
Figure 302

FAN COWL DOOR HOLD - OPEN RODS - REMOVAL/INSTALLATION

1. General

A. This procedure provides instructions for removal and installation of the fan cowl door hold-open rods. Removal/Installation procedures are identical for left and right fan cowl door hold open rods.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P03-001	Oils (Ref. 70-00-00)
B. RSE1004	Sling, Fan Cowl
C.	Mobile Crane
D.	Torque Wrench (140 lbf.in. - 1.58 m.daN)
E.	Circuit Breaker Safety Clips
F.	Universal Attach Pads
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

3. Procedure

A. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).
(2)Remove hoist point plugs from fan cowl door.
(3)Position hoist with RSE1004 fan cowl sling attached over fan cowl door and attach fan cowl sling attach pads to door. Adjust sling straps as desired.
(4)Unlatch fan cowl doors (Ref. 71-13-00, P. Block 301).
(5)With hoist, raise fan cowl door for access to hold open rods. Support door with sling and suitable lifting device.

B. Remove Fan Cowl Door Forward Hold-Open Rod (Ref. Fig. 401, 402)
(1)Remove bolt (3), spacers (4), washer (5) and nut (6) attaching forward hold-open rod (1) to fan cowl door.
(2)Pull collar down to release hold-open rod locking pin from retention bracket on fan cowl door and remove hold-open rod.

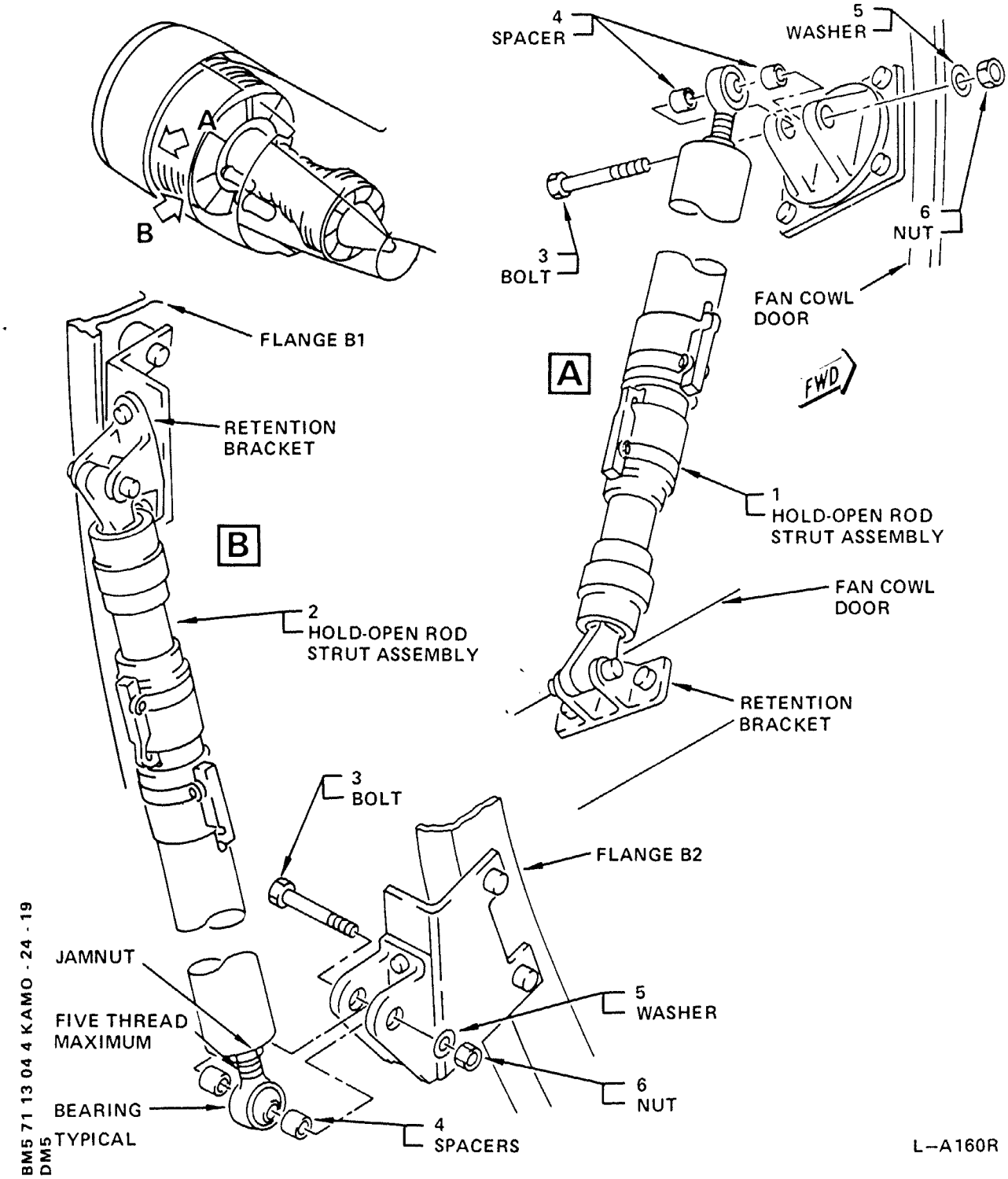
C. Remove Fan Cowl Door Aft Hold-Open Rod (Ref. Fig. 401, 402)
(1)Remove bolt (3), spacers (4), washer (5) and nut (6) attaching aft hold-open rod (2) to bracket on flange B2 (on flange B1 for right hold-open rod) of fan case.
(2)Pull collar down to release hold-open rod (2) locking pin from retention bracket on flange B1 (on flange B2 for right hold-open rod) of fan case and remove hold-open rod (2).

D. Install Fan Cowl Door Forward Hold-Open Rod (Ref. Fig. 401, 402)
(1)Lubricate threads of bolts (3) with Material P03-001.
Attach forward hold-open rod (1) to fan cowl door with bolt (3), spacers

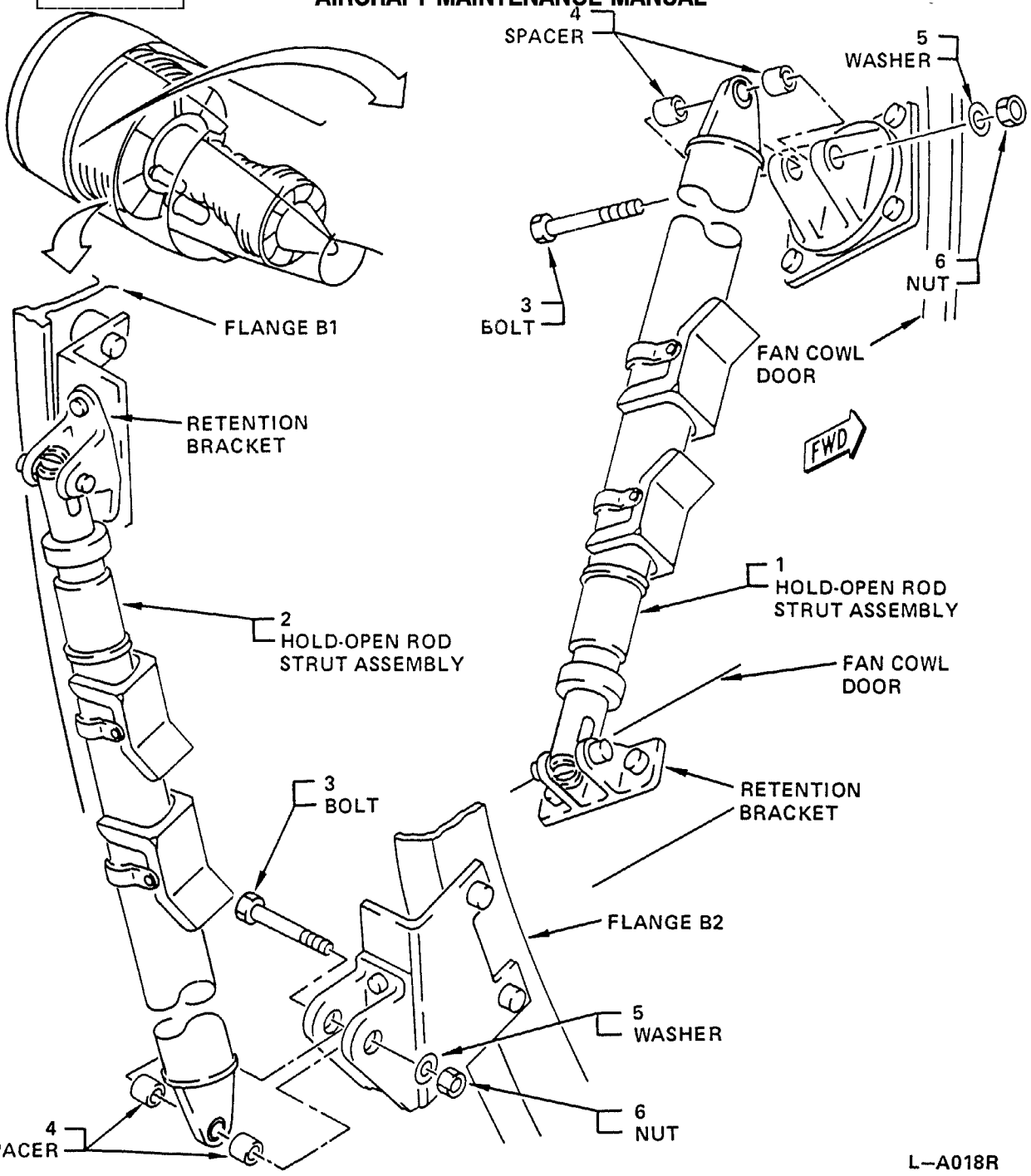
(4), washer (5) and nut (6). TORQUE nut to between 100 and 140 lbf.in. (1.13 and 1.58 m.daN).
(2)Loosen self-locking jamnut on bearing and rotate rod to increase or decrease length, as required. Threaded portion of bearing is not to extend more than 0.50 in. (12.7 mm) beyond rod.
(3)TORQUE jamnut to between 100 and 140 lbf. in. (1.13 and 1.58 m.daN).
(4)Push collar up to engage lower end of rod in retention bracket on door.

E. Install Fan Cowl Door Aft Hold-Open Rod (Ref. Fig. 401, 402)
(1)Lubricate threads of bolts (3) with Material P03-001.
Attach aft hold-open rod (2) to bracket on flange B2 (on flange B1 for right hold-open rod) of fan case with bolt (3), spacers (4), washer (5) and nut (6). TORQUE nut to between 100 and 140 lbf.in. (1.13 and 1.58 m.daN).
(2)Loosen self-locking jamnut on bearing and rotate rod to increase or decrease length, as required. Threaded portion of bearing is not to extend more than 0.50 in. (12.7 mm) beyond rod.
(3)TORQUE jamnut to between 100 and 140 lbf. in. (1.13 and 1.58 m.daN).
(4)Push collar up to engage lower end of rod in retention bracket on flange B1 (on flange B2 for right hold-open rod) of fan case.

F. Close-Up
(1)With hoist, lower fan cowl door, and latch (Ref. 71-13-00, P. Block 301).
(2)Remove fan cowl sling, attach pads.
(3)Install hoist attach point plugs.
(4)Close fan cowl door (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



Fan Cowl Door Hold-Open Rods (PRE SB PW4NAC 71-16)
Figure 401



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Fan Cowl Door Hold-Open Rods (POST SB PW4NAC 71-16)
Figure 402

FAN COWL DOOR HOLD-OPEN RODS - INSPECTION/CHECK

1. General

A. This procedure provides instructions to inspect fan cowl hold-open rods, Part Number 221D0081-501, for abnormal wear and replacement as necessary.

B. Reason for the Job

(1)Objective

Inspect hold-open rods and replace as necessary to prevent possible hold-open rod distress and malfunction.

(2)Problem

Aluminium fan cowl door hold-open rods, Part Number 221D0081-501 are subject to internal wear which can result in a wear through of the rod's outer tube wall.

(3)Cause

Abnormal wear through of hold-open rod's outer tube wall from the vibration and wear of the hold-open rod inner spring.

2. Equipment and Materials

ITEM	DESIGNATION
A. RSE1004	Sling
B.	Mobile Crane
C.	Torque Wrench (140 lbf. in - 1.58 m.dan)
D.	Circuit Breaker Safety Clips
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-04, P. Block 401	Fan Cowl Door Hold-Open Doors

3. Procedure

A. Job Set-Up

(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan cowl door for access to hold-open rod (Ref. 71-13-00, P. Block 301).

(2)Support door with sling and suitable lifting device.

B. Inspection of fan cowl hold-open rod (left fan cowl door assembly).

(1)Locate hold-open rod at forward area of left fan cowl door assembly. (Ref. Fig. 601)

(2)Disengage hold-open rod from stow bracket on left fan cowl door assembly.

(3)Visually inspect hold-open rod approximately 6.0 in. (152.4 mm) from the clevis bearing end of the rod, opposite from the autolock/latch end. If the outer surface of the tube is deformed or broken, the hold-open rod must be replaced. Proceed to paragraph 3.B.(4). If the hold-open rod passes visual inspection, proceed to paragraph 3.B.(6).

(4)Remove nut, washer, bolt, and two spacers attaching hold-open rod to clevis on left fan cowl door assembly (Ref. 71-13-04, P. Block 401). Return discrepant hold-open rod to manufacturer. Retain attaching hard-

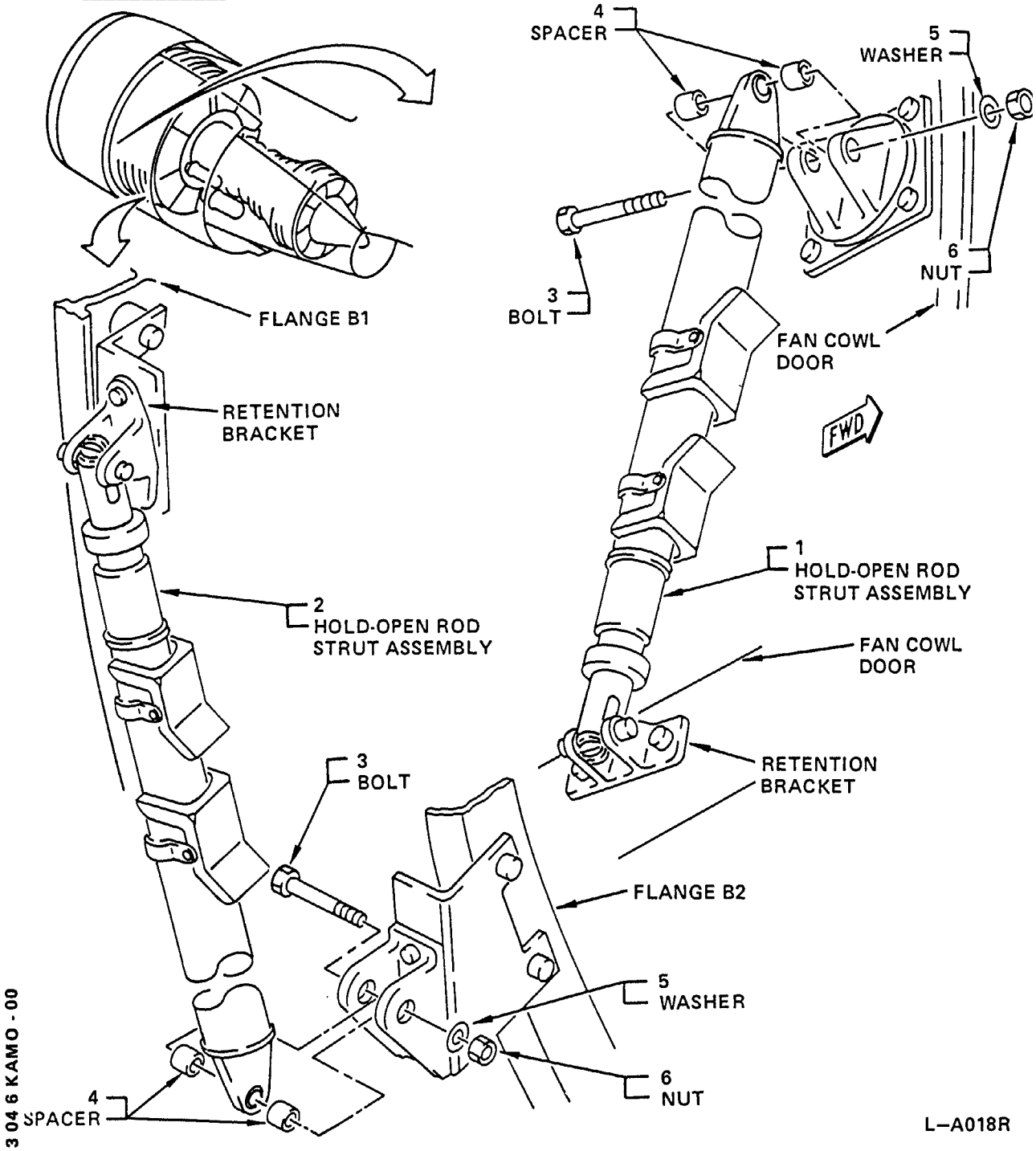
ware.
(5)Position new hold-open rod onto clevis on left fan cowl door assembly (Ref. 71-13-04, P. Block 401). Attach with two spacers, bolt, washer and nut, TORQUE nut to between 100 and 140 lbf. in. (1.13 and 1.58 m.daN).
(6)Engage hold-open rod on stow bracket on left fan cowl door assembly.

C. Inspection of fan cowl hold-open rod (right fan cowl door assembly).
(1)Inspect hold-open rod on right fan cowl door assembly and replace as necessary using procedures in paragraph 3.B.(2) through 3.B.(6) as applicable.

D. Inspection of hold-open rod on left side of engine fan case.
(1)Locate hold-open rod on left side of engine fan case. (Ref. Fig. 601)
(2)Disengage hold-open rod from stow bracket on engine fan case.
(3)Visually inspect hold-open rod approximately 6.0 inches from the clevis bearing end of the rod, opposite from the autolok/latch end. If the outer surface of the tube is deformed or broken, the hold-open rod must be replaced.
Proceed to paragraph 3.D.(4). If the hold-open rod passes visual inspection, proceed to paragraph 3.D.(6).
(4)Remove nut, washer, bolt, and two spacers attaching hold-open rod to engine fan case bracket (Ref. 71-13-04, P. Block 401). Return discrepant hold-open rod to manufacturer. Retain attaching hardware.
(5)Position new hold-open rod on engine fan case bracket (Ref. 71-13-04, P. Block 401). Attach with two spacers, bolt, washer, and nut. TORQUE nut to between 100 and 140 lbf.in. (1.13 and 1.58 m.daN).
(6)Engage hold-open rod on stow bracket on engine fan case.

E. Inspection of hold-open rod on right side of engine fan case.
(1)Inspect hold-open rod and replace as necessary using procedures in paragraph 3.D.(2) through 3.D.(6) as applicable.

F. Close-Up
(1)Remove sling.
(2)Close fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



Inspection and Replacement of Hold Open Rod
on Fan Cowl
Figure 601

FAN COWL DOOR LATCH - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Corrosion - Resistant Steel Lockwire (MS20995N32) (Ref. 70-00-00)
B.	Circuit Breaker Safety Clips
C. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-05, P. Block 501	Fan Cowl Door Latch

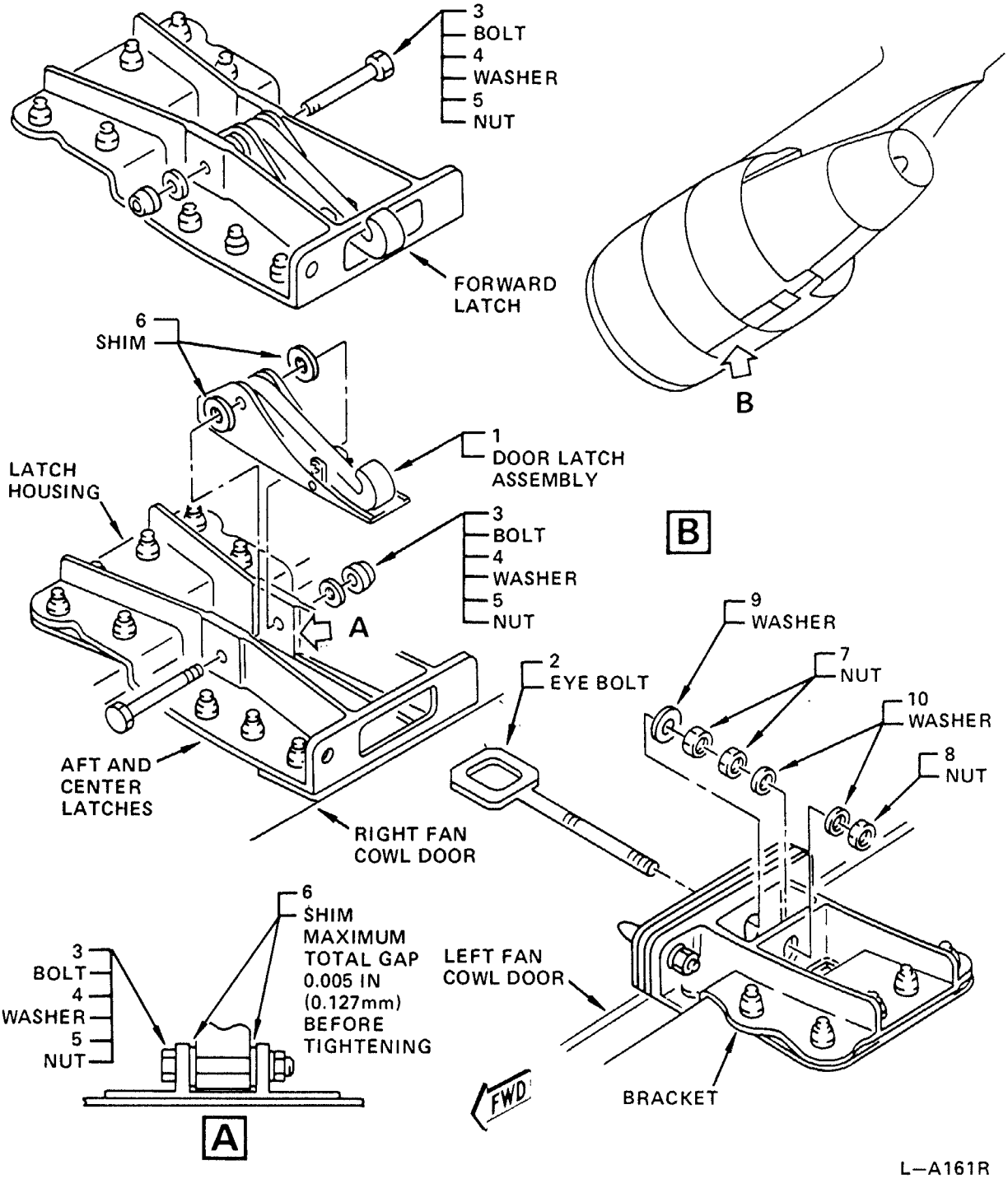
2. Procedure

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan cowl door (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Remove lockwire, nuts, and washers from eye bolt and remove eye bolt from bracket.
(2)Remove nut, washer, bolt, and shims in door latch assembly and remove door latch assembly from latch housing.

C. Installation (Ref. Fig. 401)
(1)Position latch (1) and shims (6) in latch housing. Lubricate threads of bolt (3) with Material No.P03-001. Align shims and install bolt (3) washer (4) and nut (5). TORQUE nut to TBD.
(2)Make certain that maximum gap does not exceed 0.005 in. (0.127 mm) between door latch assembly shims (6) and latch housing.
(3)Lubricate threads of eye bolt (2) with Material No.P03-001. Install eye bolt (2) in bracket with washer (9), nuts (7), washers (10) and nut (8). TORQUE center nuts (7) against bracket wall to between 25 and 30 lbf.in. (0.28 and 0.34 m.daN).
(4)Adjust latch (Ref. 71-13-05, P. Block 501).

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close fan cowl door, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



Fan Cowl Door Latch Assembly
Figure 401

FAN COWL DOOR LATCH - ADJUSTMENT/TEST

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
R B.	Push-Pull Gage (Model LG-100 or Equivalent)
C.	Corrosion Resistant Steel Lockwire (MS33540) (Ref. 70-00-00)
D. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up
Open, safety and tag the circuit breakers for the appropriate engine and open fan cowl doors (Ref. 71-13-00, P. Block 301).

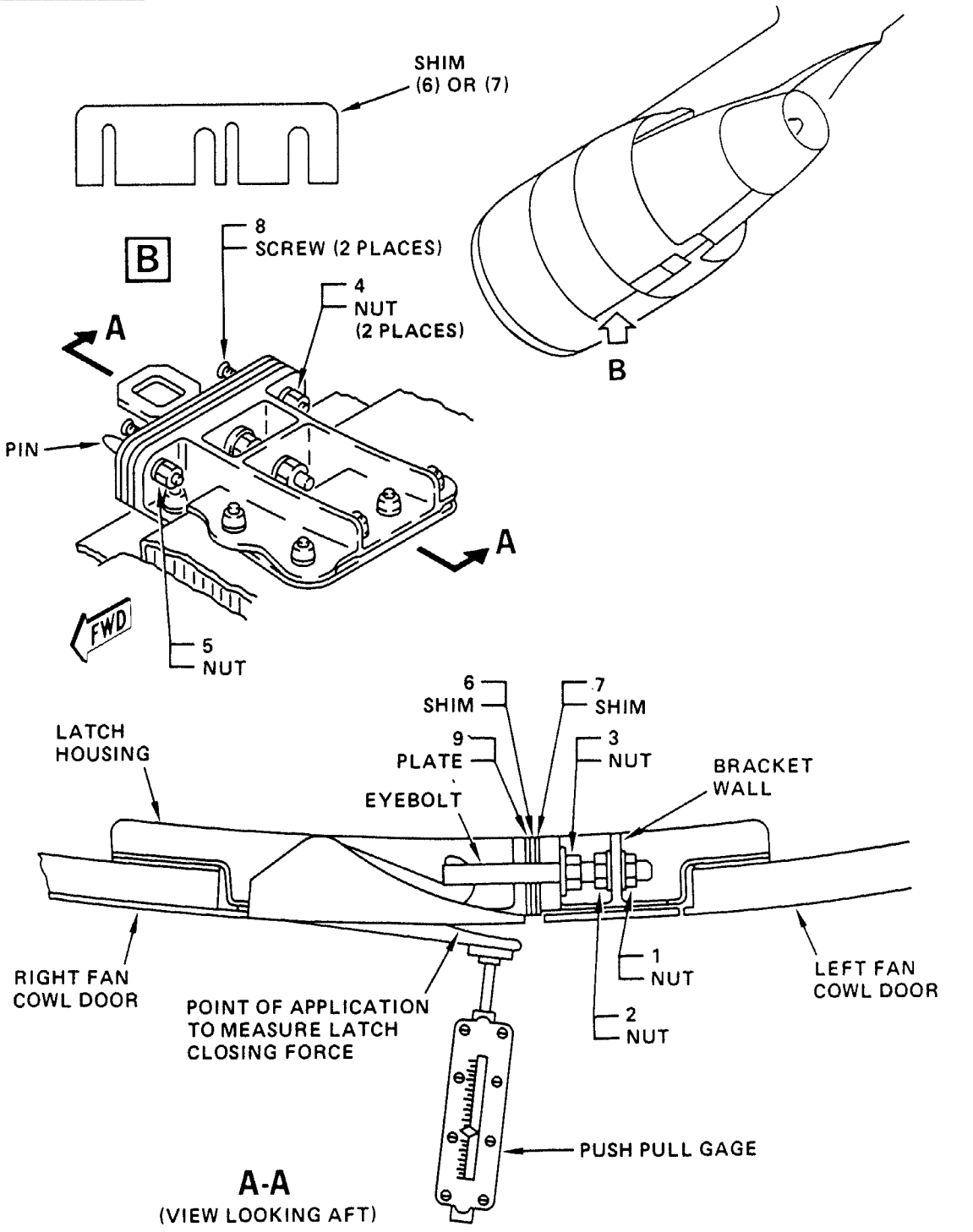
B. Test (Ref. Fig. 501)
(1)Open one latch. Adjacent latches must remain closed.
(2)Attach push-pull gage near end of latch handle and close latch using hand pressure only on gage.
(3)Check gage for required closing force of 60 - 75 pounds (27.2 - 33.9 kg)
(4)If closing force is not within specified limits, perform latch adjustment.

C. Adjustment (Ref. Fig. 501)
(1)Remove four screws securing access panel outboard of latch on left fan cowl door and remove panel.
(2)Remove lockwire securing locking nut (1) to left fan cowl door bracket wall.
(3)Loosen locking nuts (1), (2), (3), (4), and (5) securing eyebolt, plate, shims and pin.
(4)Remove and adjust thickness of shim (7) to proper thickness to obtain positive stop at latch points with fan cowl doors closed.
(5)Install shim (7) between latch housing and metal shim (6) and TORQUE nuts (4) (2 places) to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).
(6)TORQUE nut (5) securing latch alignment pin to between 50 and 70 lbf. in. (0.56 and 0.79 m.daN).
(7)Turn adjustment nut (3) as necessary to raise or lower latch closing force to obtain 60 and 75 pounds (27.22 - 33.9 Kg).
(8)TORQUE locking nuts (1) and (2) against bracket wall to between 25 and 30 lbf. in. (0.28 and 0.34 m.daN).
(9)Check for latch closing force of 60 - 75 pounds (27.2 - 33.9 Kg). Repeat steps (7), (8), and (9) as necessary.
(10)Wirelock adjustment nut (1) to eyebolt.
(11)Install access panel and secure with screws with Material P03-001. TORQUE screws to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).
(12)Repeat procedure for each latch requiring adjustment.

D. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close fan cowl doors (Ref. 71-13-00, P. Block 301).
Remove safety clips and tags and close circuit breakers for the appropriate engine.



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Fan Cowl Door Latch Adjustment
Figure 501

FAN COWL DOOR LATCH - CLEANING/PAINTING

1. Painting of Fan Cowl Latch Assemblies (Pre SB PW4NAC 71-162)

A. General

(1)This procedure provides instructions to paint the handle and trigger of the fan cowl door latch assemblies red to make open latches more visible (Ref. Fig. 701).

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-005	Special Materials
(2)Material No.P05-376	Special Materials
(3)Material No.P11-014	Cleaning Agents
(4)Material No.P18-001A	Primer
(5)Material No.P16-004	Structure Paints
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-13-05, P. Block 401	Fan Cowl Door Latch
- 71-13-05, P. Block 401	Fan Cowl Door Latch

C. Painting

(1)Job set-up

(a)Open, safety and tag circuit breakers for the appropriate engine.

(b)Open the right hand fan cowl door (Ref. 71-13-00, P. Block 301).

(2)Procedure (Ref. Fig. 701, 702)

CAUTION : OPERATORS WITH RED NACELLES OR A COLOR THAT DOES NOT CONTRAST SUFFICIENTLY WITH THE RED LATCH PAINT MUST CONTACT GOODRICH AEROSTRUCTURES GROUP CUSTOMER SUPPORT FOR OPTIONAL COLOR.

(a)Remove three fan cowl latch assemblies from the right hand fan cowl door (Ref. 71-13-05, P. Block 401).

WARNING : ISOPROPYL ALCOHOL (MATERIAL NO.P11-014) IS FLAMMABLE AND VAPOR IS HARMFUL. USE IN A WELL VENTILATED AREA. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION TO THE EYES, NOSE, THROAT AND SKIN. OVER EXPOSURE MAY CAUSE HEADACHE, DIZZINESS AND DROWSINESS. PROTECTIVE GLOVES SHOULD BE WORN DURING USE. MAY CAUSE DERMATITIS BY REMOVING SKIN OILS. BEFORE USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(b)Wipe surfaces to be painted with a Lint-Free Cotton Cloth (Material No.P05-005) moistened with Isopropyl Alcohol (Material No.P11-014).

(c)To prevent over spray, cover the surfaces that are not to be primed with Masking Tape (Material No.P05-376).

NOTE : No paint is allowed on the hook, link assembly or in the slots on each side of the handle.

WARNING : EPOXY PRIMER (MATERIAL NO.P18-001A) IS CLASSIFIED AS A HAZARDOUS MATERIAL WHICH MAY CAUSE INJURY OR ILLNESS IF NOT PROPERLY USED. THIS PRODUCT SHOULD BE USED ONLY IN ACCORDANCE

WITH THE MANUFACTURES'S SPECIFIC SAFETY AND HEALTH RECOMMENDATIONS. BEFORE USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(d)Follow the manufacturer's instructions to prepare and apply Epoxy Primer (Material No.P18-001A) to the handle and trigger.

WARNING : PAINT (MATERIAL NO.P16-004) IS CLASSIFIED AS A HAZARDOUS MATERIAL WHICH MAY CAUSE INJURY OR ILLNESS IF NOT PROPERLY USED. THIS PRODUCT SHOULD BE USED ONLY IN ACCORDANCE WITH THE MANUFACTURES'S SPECIFIC SAFETY AND HEALTH RECOMMENDATIONS. BEFORE USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(e)Follow the manufacturer's instructions to prepare and apply Paint (Material No.P16-004) to the handle and trigger.

(f)Remove masking tape.

(g)Install three fan cowl latch assemblies at the right hand fan cowl door (Ref. 71-13-05, P. Block 401).

(h)Do the fan cowl door latch adjustment test on each latch assembly (Ref. 71-13-05, P. Block 501).

(3)Close-up

(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(b)Close the right hand fan cowl door (Ref. 71-13-00, P. Block 301).

(c)Remove safety clips and tags and close circuit breakers.

2. Touch Up Painting of Trigger and Handle (Post SB PW4NAC 71-162)

A. General

(1)This procedure provides instructions to touch up chipped or worn paint on the fan cowl latch assembly handle and trigger.

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-005	Special Materials
(2)Material No.P05-376	Special Materials
(3)Material No.P11-014	Cleaning Agents
(4)Material No.P18-001A	Primer
(5)Material No.P16-004	Structure Paints
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors

C. Painting

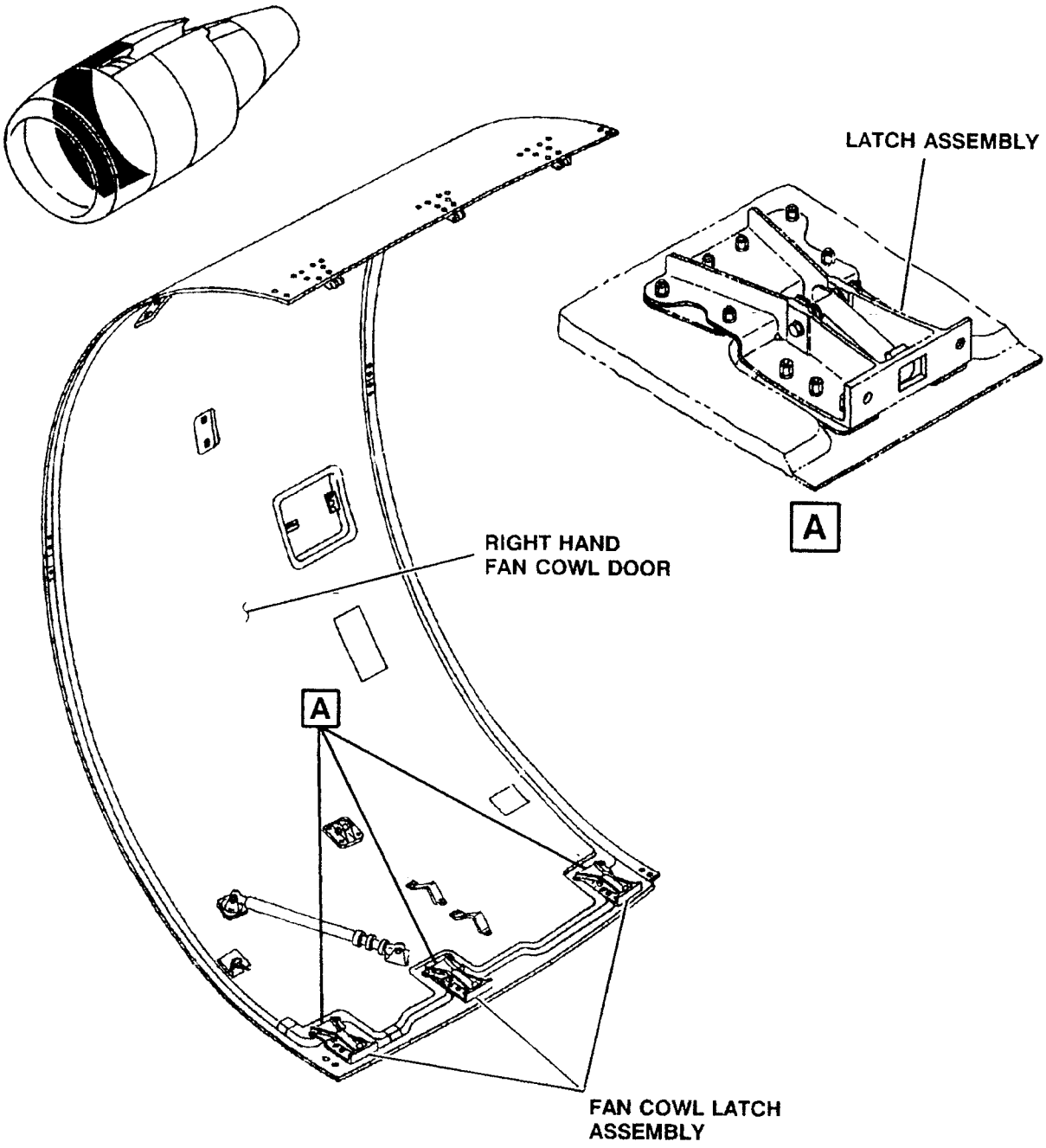
(1)Job set-up

(a)Open, safety and tag circuit breakers for the appropriate engine.

(b)Open the right hand fan cowl door (Ref. 71-13-00, P. Block 301).

(2)Procedure (Ref. Fig. 701, 702)

WARNING : ISOPROPYL ALCOHOL (MATERIAL NO.P11-014) IS FLAMMABLE AND VAPOR IS HARMFUL. USE IN A WELL VENTILATED AREA. AVOID



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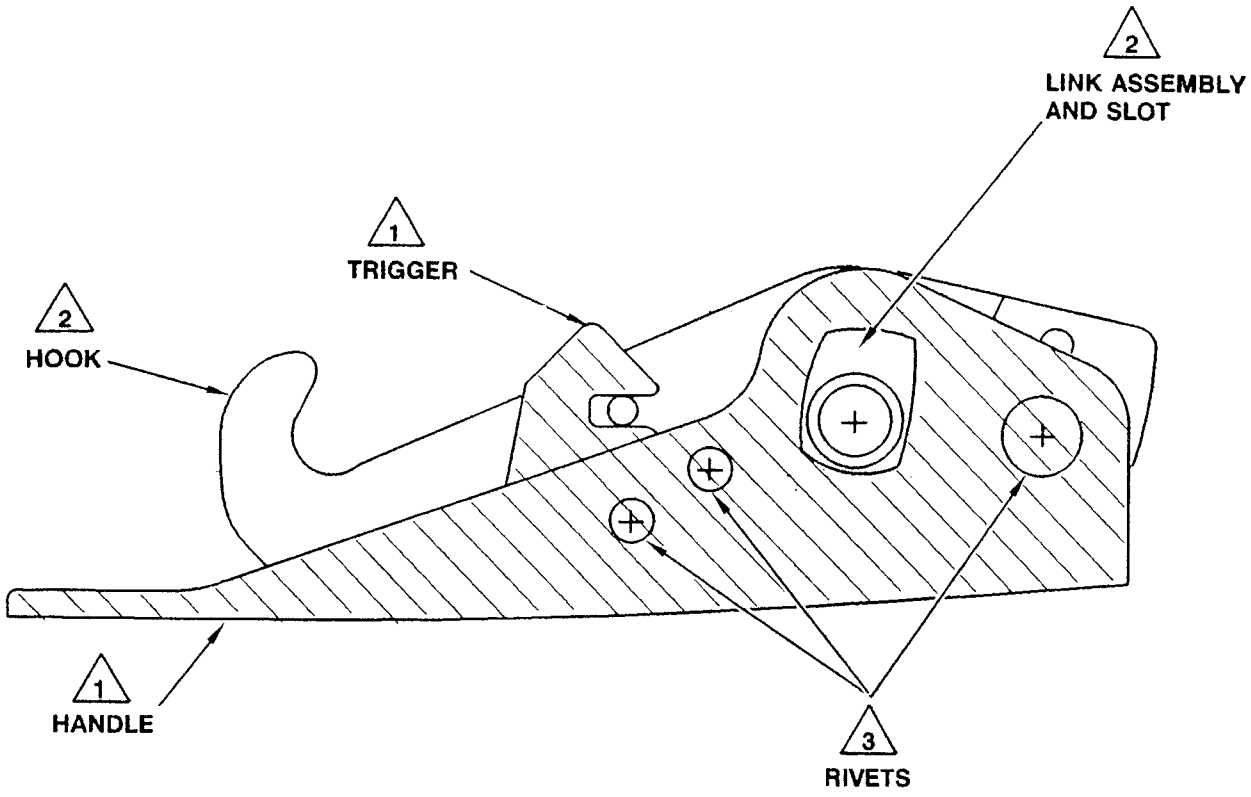
Fan Cowl Door Latch Assemblies
Figure 701



1 APPLY PRIMER AND PAINT TO EACH SIDE SURFACE OF HANDLE AND TRIGGER AS SHOWN BY THE DASHED LINES.

2 DO NOT APPLY PAINT TO HOOK, LINK ASSEMBLY, OR IN SLOTS ON EACH SIDE SURFACE OF HANDLE.

3 PRIMER AND PAINT ARE PERMITTED ON RIVETS IN EACH SIDE SURFACE OF HANDLE.

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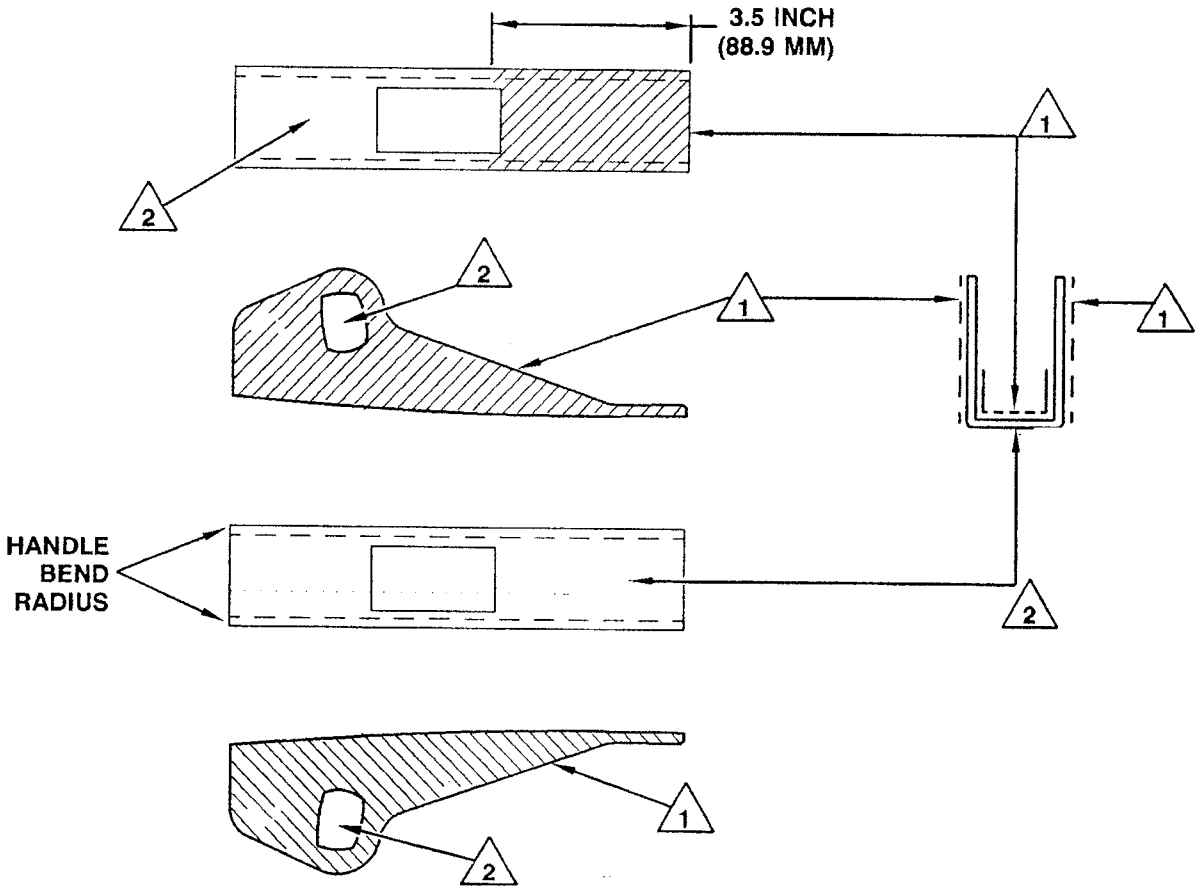
Latch Assembly Primer and Paint Application (Sheet 1)
Figure 702



HANDLE DETAIL

1 APPLY PRIMER AND PAINT AS SHOWN BY DASHED LINES TO EACH SIDE SURFACE OF HANDLE AND INSIDE SURFACE OF HANDLE TO DIMENSION SHOWN.

2 DO NOT APPLY PRIMER AND PAINT TO OUTER SURFACE OF HANDLE BEYOND HANDLE BEND RADIUS, INSIDE SURFACE OF HANDLE BEYOND DIMENSION SHOWN, AND SLOTS IN EACH SIDE SURFACE OF HANDLE.

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Latch Assembly Primer and Paint Application (Sheet 2)
Figure 702

PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION TO THE EYES, NOSE, THROAT AND SKIN. OVER EXPOSURE MAY CAUSE HEADACHE, DIZZINESS AND DROWSINESS. PROTECTIVE GLOVES SHOULD BE WORN DURING USE. MAY CAUSE DERMATITIS BY REMOVING SKIN OILS. BEFORE USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(a)Wipe surfaces to be painted with a Lint-Free Cotton Cloth (Material No.P05-005) moistened with Isopropyl Alcohol (Material No.P11-014).

(b)Cover the surfaces that do not require paint with Masking Tape (Material No.P05-376).

NOTE : No paint is allowed on the hook, link assembly or in the slots on each side of the handle.

WARNING : EPOXY PRIMER (MATERIAL NO.P18-001A) IS CLASSIFIED AS A HAZARDOUS MATERIAL WHICH MAY CAUSE INJURY OR ILLNESS IF NOT PROPERLY USED. THIS PRODUCT SHOULD BE USED ONLY IN ACCORDANCE WITH THE MANUFACTURES'S SPECIFIC SAFETY AND HEALTH RECOMMENDATIONS. BEFORE USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(c)Follow the manufacturer's instructions to prepare and apply Epoxy Primer (Material No.P18-001A) to bare metal surface(s). (Ref. Fig. 702) for painted surfaces.

WARNING : PAINT (MATERIAL NO.P16-004) IS CLASSIFIED AS A HAZARDOUS MATERIAL WHICH MAY CAUSE INJURY OR ILLNESS IF NOT PROPERLY USED. THIS PRODUCT SHOULD BE USED ONLY IN ACCORDANCE WITH THE MANUFACTURES'S SPECIFIC SAFETY AND HEALTH RECOMMENDATIONS. BEFORE USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(d)Follow the manufacturer's instructions to prepare and apply Paint (Material No.P16-004) to the handle and trigger.

(e)Remove masking tape.

(3)Close-up

(a)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(b)Close the right hand fan cowl door (Ref. 71-13-00, P. Block 301).

(c)Remove safety clips and tags and close circuit breakers.

FAN COWL PRESSURE RELIEF DOOR LATCH - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
R B.	Push-Pull Gage (Model LG-100) (or Equivalent)
C.	Padding
D.	Torque Wrench
E. RSE1164	Torque Adapter Tool
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up

(1) Open, safety and tag the appropriate circuit breakers and open fan cowl doors (Ref. 71-13-00, P. Block 301).

B. Inspection/Check of Fan Cowl Pressure Relief Door

WARNING : PLACE PADDING ON OUTSIDE OF DOOR TO PROTECT PERSONNEL FROM INJURY AND DOOR FROM DAMAGE. WHEN PRESSURE IS APPLIED TO DOOR, LATCHES WILL RELEASE AND DOOR WILL SUDDENLY OPEN.

(1) Position and hold padding against outside surface of fan cowl pressure relief door.

(2) Place push-pull gage on inside of door near outboard latch line and apply force. (Ref. Fig. 601)

NOTE : Make certain that latch roller and contact surface are free of any foreign matter which could hinder latch action and produce incorrect latch release reading.

(3) Check the gage reads between 56 and 68 lbf (24.9 and 30.2 daN) when latch releases and door opens.

(4) If door opens at a force less than 56 lbf (24.9 daN) or more than 68 lbf (30.2 daN), replace failed pressure relief door latch.

C. Inspection/Check of Fan Cowl Pressure Relief Door Latch

(1) Calculate the indicated torque wrench value required to open the latch with the following formula:

$$0.53P \frac{(L)}{L + 1.5}$$

Where : P = Latch release load
L = Torque wrench length

The latch release loads for the fan cowl pressure relief door are 56 - 68 lbf (24.9 and 30.2 daN).

Example :
Latch release load = 56 lbf
Torque wrench length = 12 in.

$$0.53 \times 56 \frac{(12)}{12 + 1.5}$$

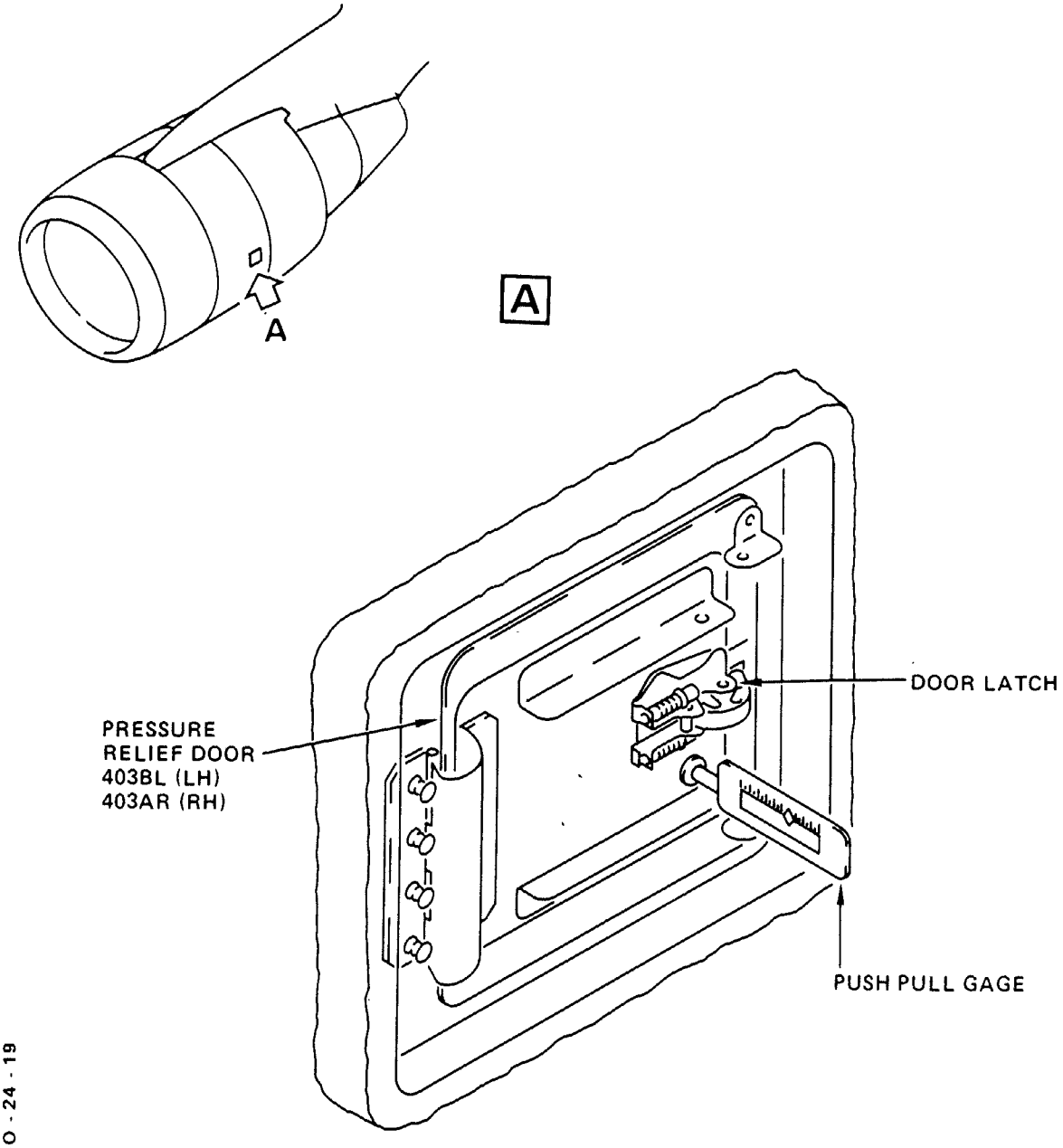
29.68 x 0.8888889 = 26.382222, which may be rounded to 26 lbf.in.

The indicated torque on the torque wrench when the latch releases should
R be between 26 and 32 lbf.in. (0.29 and 0.36 m.daN).

NOTE : Make certain that latch roller and contact surface are free of any foreign matter which could hinder latch action and/or give incorrect latch release readings.

(2)Install the RSE1164 tool on torque wrench (Ref. Fig. 602)
(3)Put the torque wrench in the latch slot and apply force to the torque wrench. Make certain the force is perpendicular to the torque wrench handle.
(4)Ensure the torque wrench reads within the range for the calculated values when the latch releases.
(5)If the door opens at a force less than or greater than the calculated force replace failed pressure relief door latch.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove safety clips and tags and close circuit breakers. Close fan cowl doors (Ref. 71-13-00, P. Block 301).



TYPICAL LH AND RH SIDE

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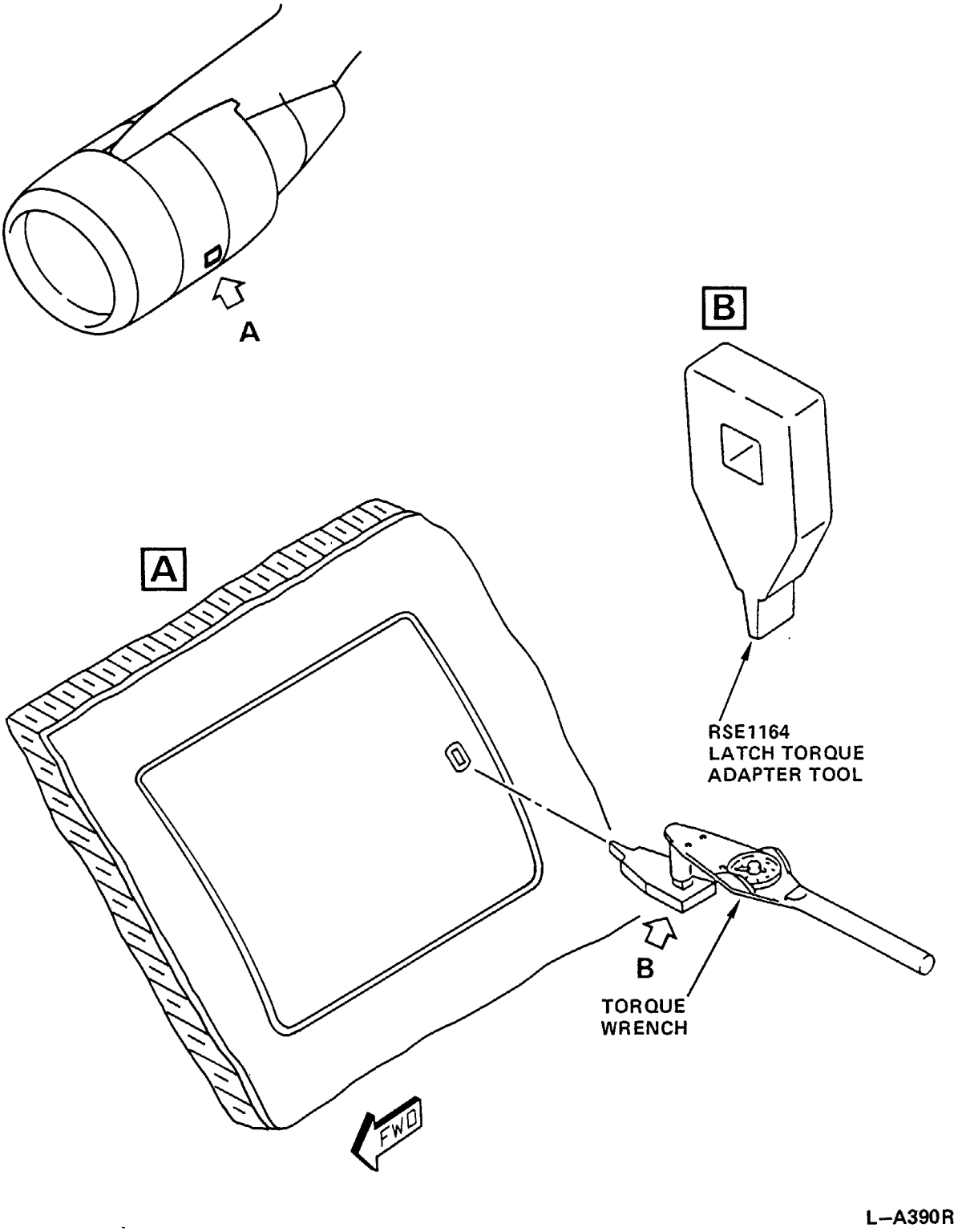
Fan Cowl Pressure Relief Door
Figure 601



Fan Cowl Pressure Relief Door Latch
Figure 602

THRUST REVERSER PRESSURE RELIEF DOOR - INSPECTION/CHECK

1. Operational Check Procedure of Thrust Reverser Pressure Relief Door Latches

A. Equipment and Materials

ITEM	DESIGNATION
A.	Torque Wrench
B. RSE1164	Torque Adapter Tool

B. Procedure

(1)Calculate the indicated torque wrench value required to open the latch with the following formula:

$$0.53P \frac{(L)}{L + 1.5} - 4$$

Where : P = Latch release load
L = Torque wrench length

Example :
Latch release load = 62.5 lbf (27.8 daN)
Torque wrench length = 12 in. (304.8 mm)

$$0.53 \times 62.5 \frac{(12)}{12 + 1.5} - 4$$

(33.13 x 0.8888889) - 4 = 25.445, which may be rounded to 25 lbf.in. (0.282 m.daN)

NOTE : This example uses a 12 inch torque wrench. The indicated torque values will vary for different length torque wrenches.

(a)For Pre SB PW4NAC 78-45 thrust reversers, the latch release loads for the thrust reverser pressure relief doors are between 57 and 67 lbf (25.4 and 29.8 daN).
Using a 12 inch torque wrench, the indicated torque on the torque wrench when the latch releases should be between 23 and 28 lbf.in. (0.26 and 0.31 m.daN).

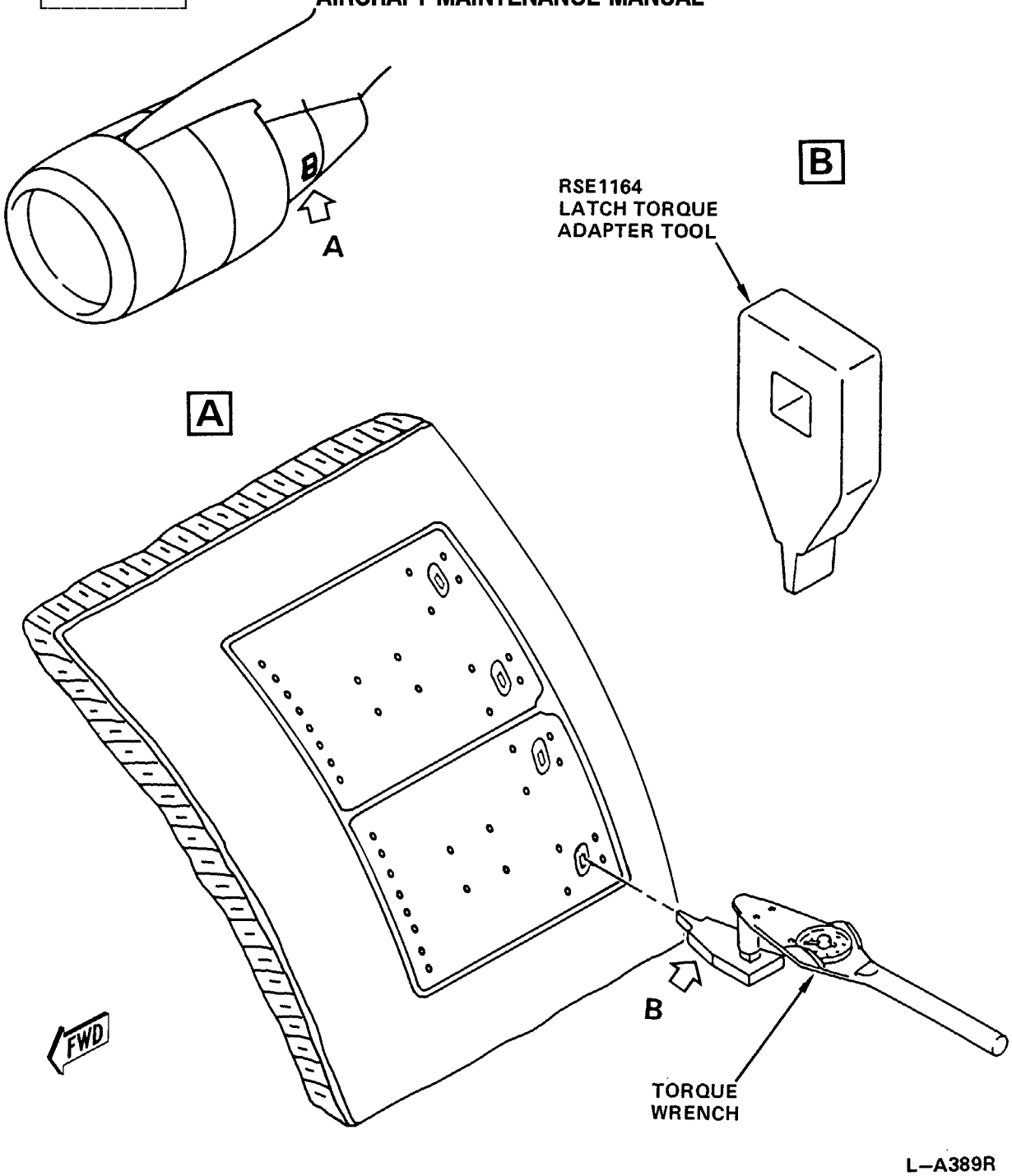
(b)For Post SB PW4NAC 78-45 thrust reversers, the latch release loads for the thrust reverser pressure relief doors are between 80 and 98 lbf (35.6 and 43.5 daN).
Using a 12 inch torque wrench, the indicated torque on the torque wrench when the latch releases should be between 34 and 42 lbf.in. (0.38 and 0.47 m.daN).

(c)For Post Serial Number 0714001 thrust reversers, the latch release loads for the pressure relief doors are between 95 and 115 lbf (42.3 and 51.1 daN).
Using a 12 inch torque wrench, the indicated torque on the torque wrench when the latch releases should be between 41 and 50 lbf.in. (0.47 and 0.56 m.daN).

(2)Install the RSE1164 tool on torque wrench (Ref. Fig. 601)

(3)Put the torque wrench in the latch slot and apply force to the torque wrench. Make certain the force is perpendicular to the torque wrench handle.

(4)Make certain that the torque wrench reads within the range for the calculated values when the latch releases.
(5)If the door opens at a force less than or more than the calculated force, replace failed pressure relief door latch.



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Thrust Reverser Pressure Relief Door Latches
Figure 601

FAN COWL DOOR HINGE FITTINGS - INSPECTION/CHECK

1. General

A. This procedure provides instructions for visually inspecting the fan cowl door hinge fittings.

B. The accomplishment of this procedure requires opening of the fan cowl doors. See 71-13-00, P. Block 301 for opening and closing procedures.

2. Equipment and Materials

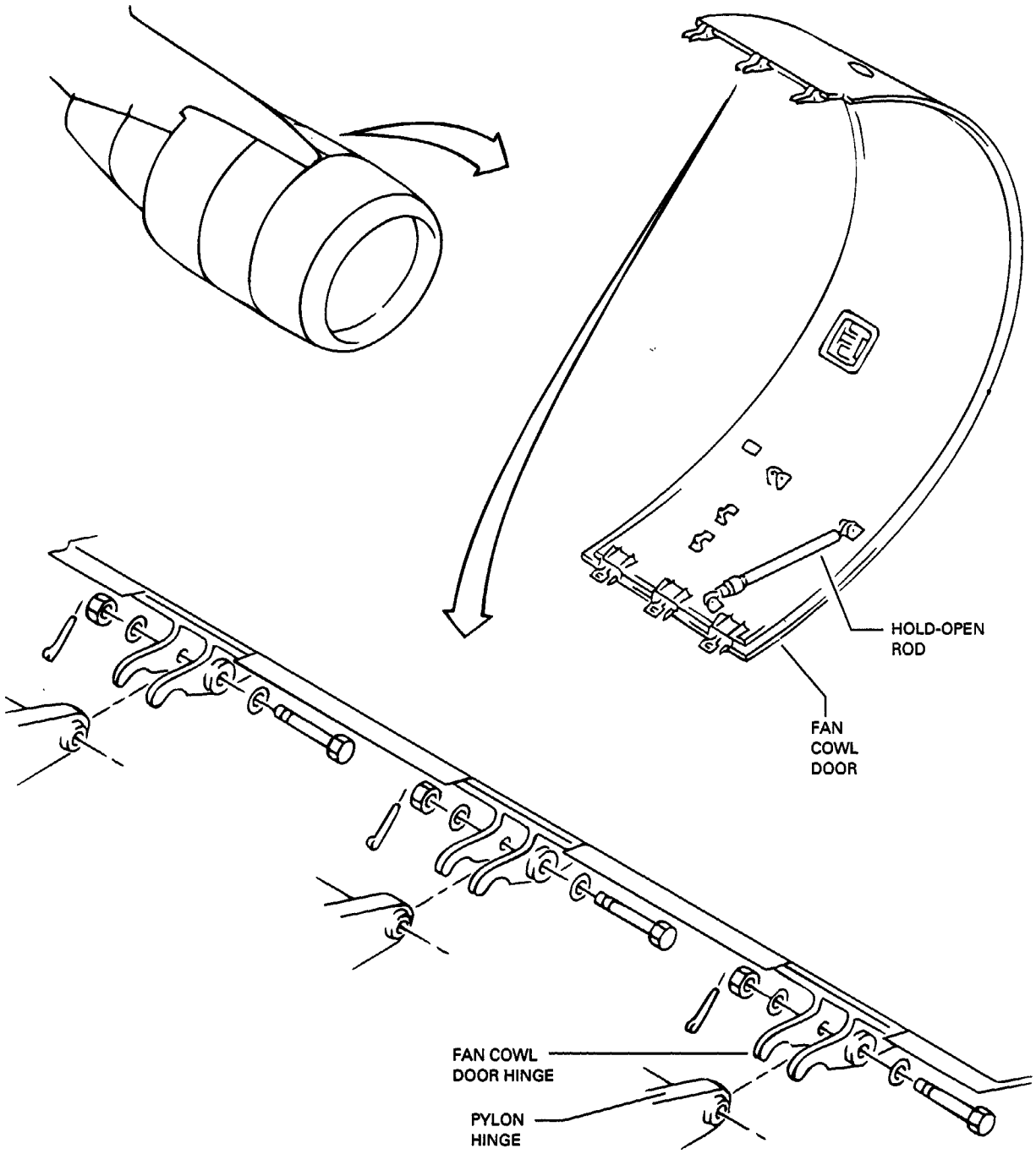
ITEM	DESIGNATION
A.	Flashlight
B.	Inspection Mirror
C.	Magnifying Glass 20X
- Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

3. Visually Inspect Fan Cowl Door Hinge Fittings

A. Job Set-Up
(1) Open safety and tag the appropriate circuit breakers and open applicable fan cowl door to the full open position position (Ref. 71-13-00, P. Block 301).

B. Procedure (Ref. Fig. 601)
(1) Inspect hinge fittings using flashlight, inspection mirror, and 20X magnifying glass.
(2) Visually check hinge fitting areas for cracks, dents, corrosion, wear, stripped or crossed threads, thread root cracks, fatigue cracks, scored areas, condition of finish, coatings, and plating, and any other damage or defect that could affect serviceability of the hinge.
(3) No cracks, breaks, deformed or warped conditions are permitted. If defective, replace.

C. Close-Up
(1) Make certain working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close fan cowl door, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



Fan Cowl Door Hinges
Figure 601

THRUST REVERSER COWL DOORS HINGE FITTINGS - INSPECTION/CHECK

1. General

A. This procedure provides instructions for visually inspecting the thrust reverser hinge fittings.

B. The accomplishment of this procedure requires opening of the fan cowl doors and the thrust reverser door. See 71-13-00, P. Block 301, for opening and closing procedures.

2. Equipment and Materials

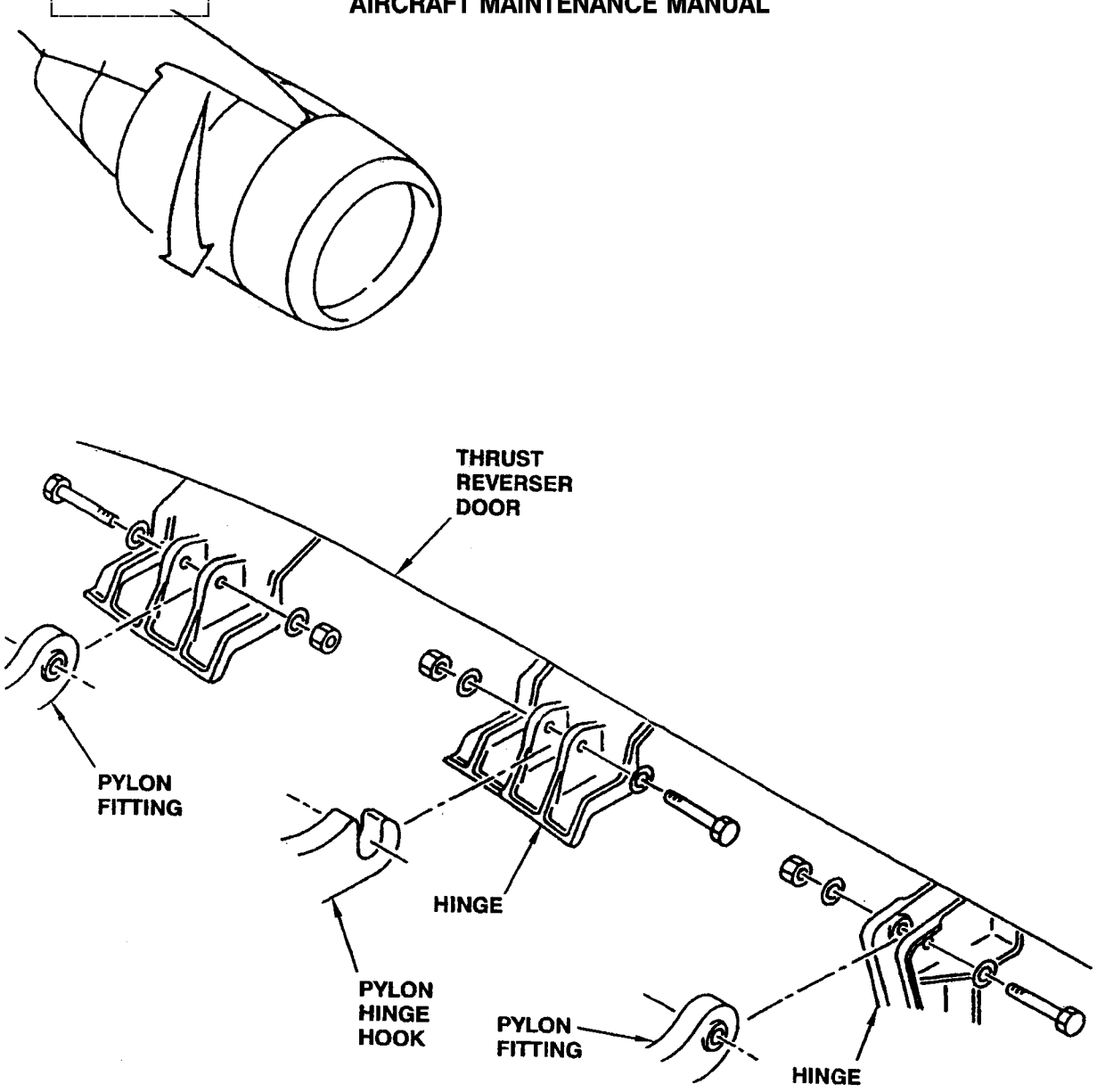
ITEM	DESIGNATION
A.	Flashlight
B.	Inspection Mirror
C.	Magnifying Glass 20 X
- Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

3. Visually Inspect Thrust Reverser Cowl Doors Hinge Fittings

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open applicable fan and thrust reverser cowl doors to full open position (Ref. 71-13-00, P. Block 301).

B. Procedure (Ref. Fig. 601)
(1)Inspect hinge fittings using flashlight, inspection mirror, and 20 X magnifying glass.
(2)Visually check hinge fitting areas for cracks, dents, corrosion, wear, stripped or crossed threads, thread root cracks, fatigue cracks, scored areas, condition of finish, coatings, and plating, and any other damage or defect that could affect serviceability of the hinge.
(3)No cracks, breaks, deformed or warped conditions are permitted. If defective, replace.

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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Thrust Reverser Cowl Door Hinges
Figure 601

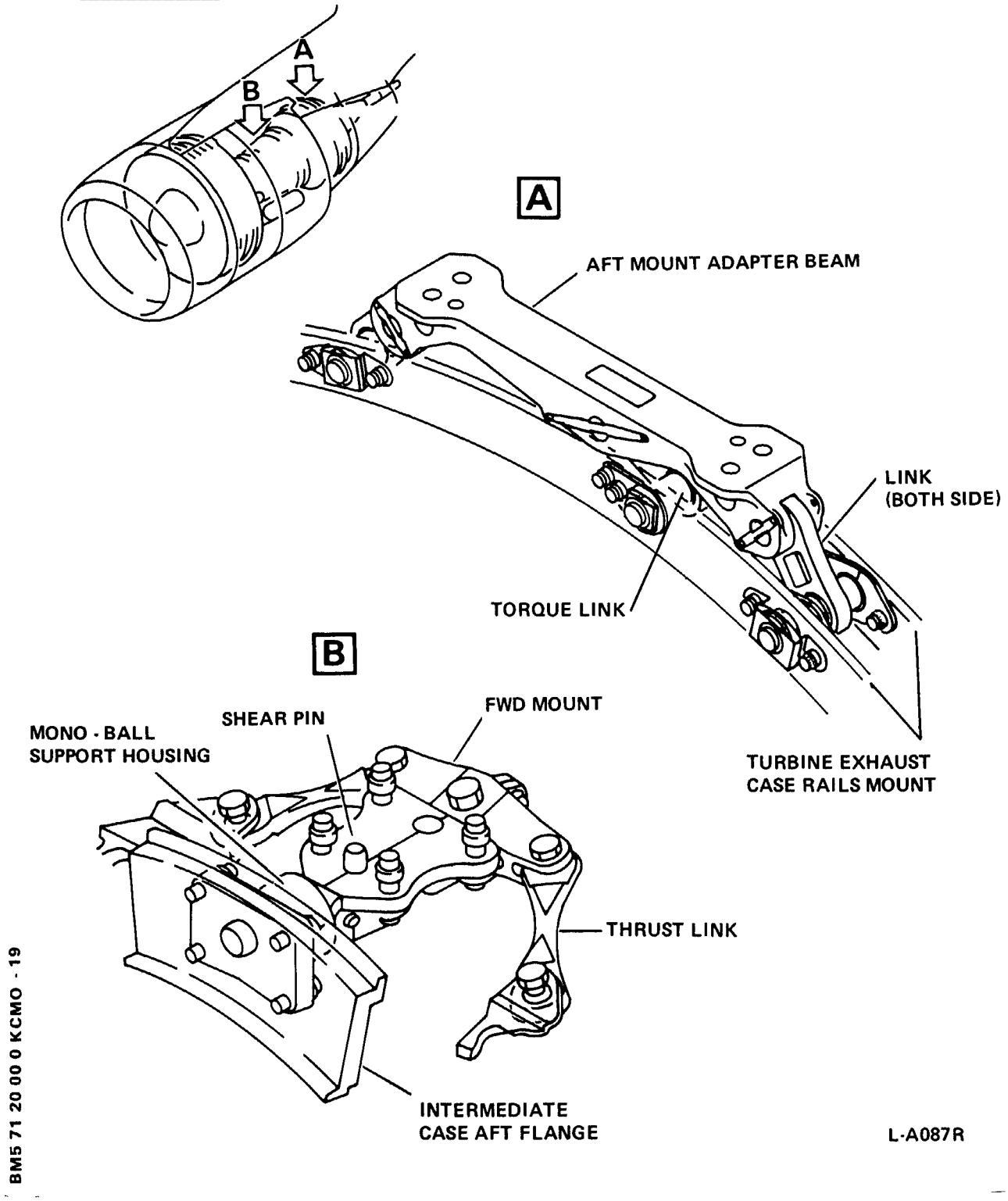
MOUNTS - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 002, 001)

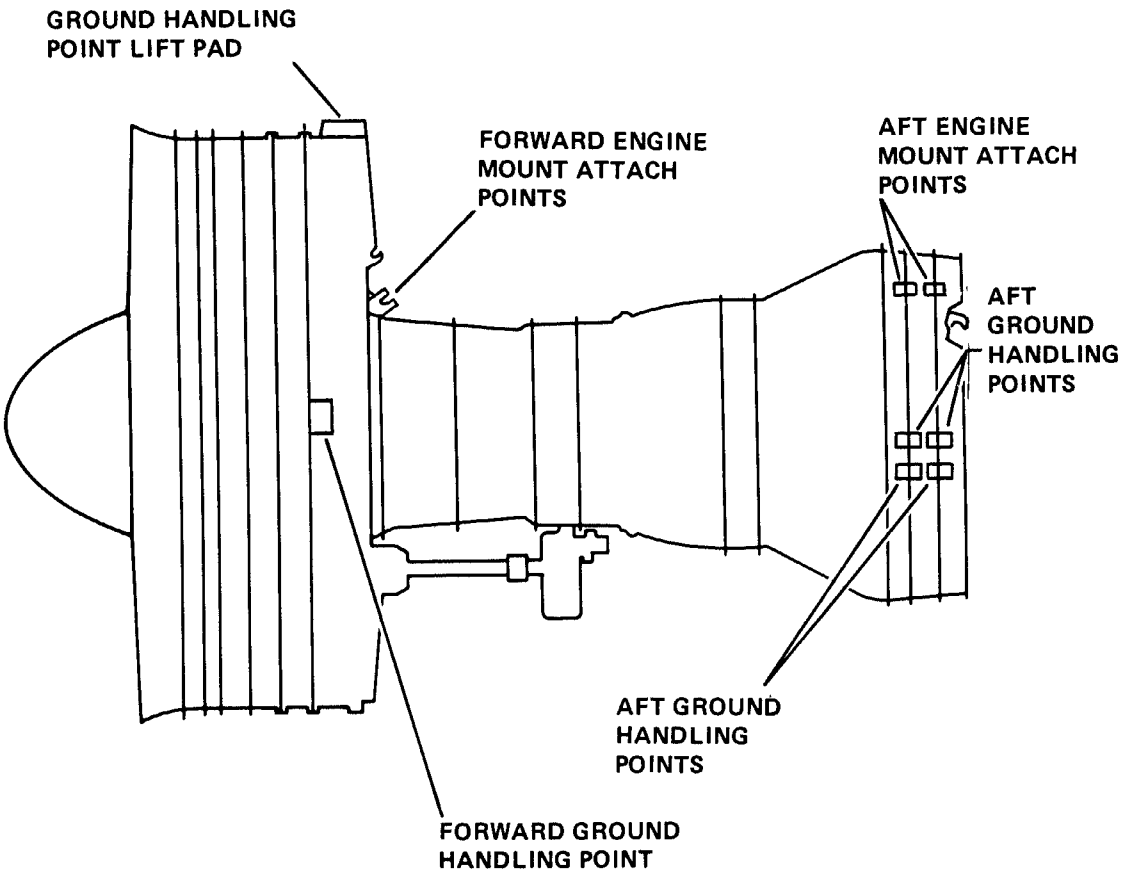
A. The engine installation utilizes a two-point, safe life mount linkage system to support the engine, attach the engine to the aircraft, and transmit loads from the engine to the pylon structure.

B. The mount system consists of a forward mount located on the aft face of the intermediate case flange and an aft mount located between two rails on the turbine exhaust case.

C. Both engine mounts are made of inconel 718 and steel which are fire-proof materials.



Engine Forward and Aft Mounts
Figure 001



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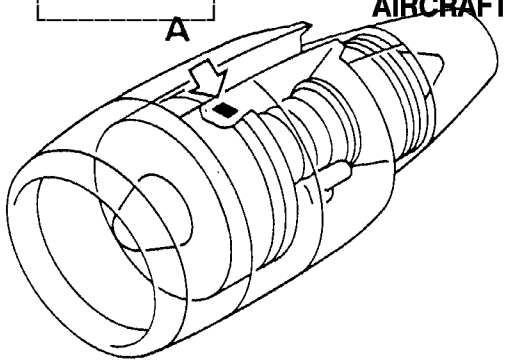
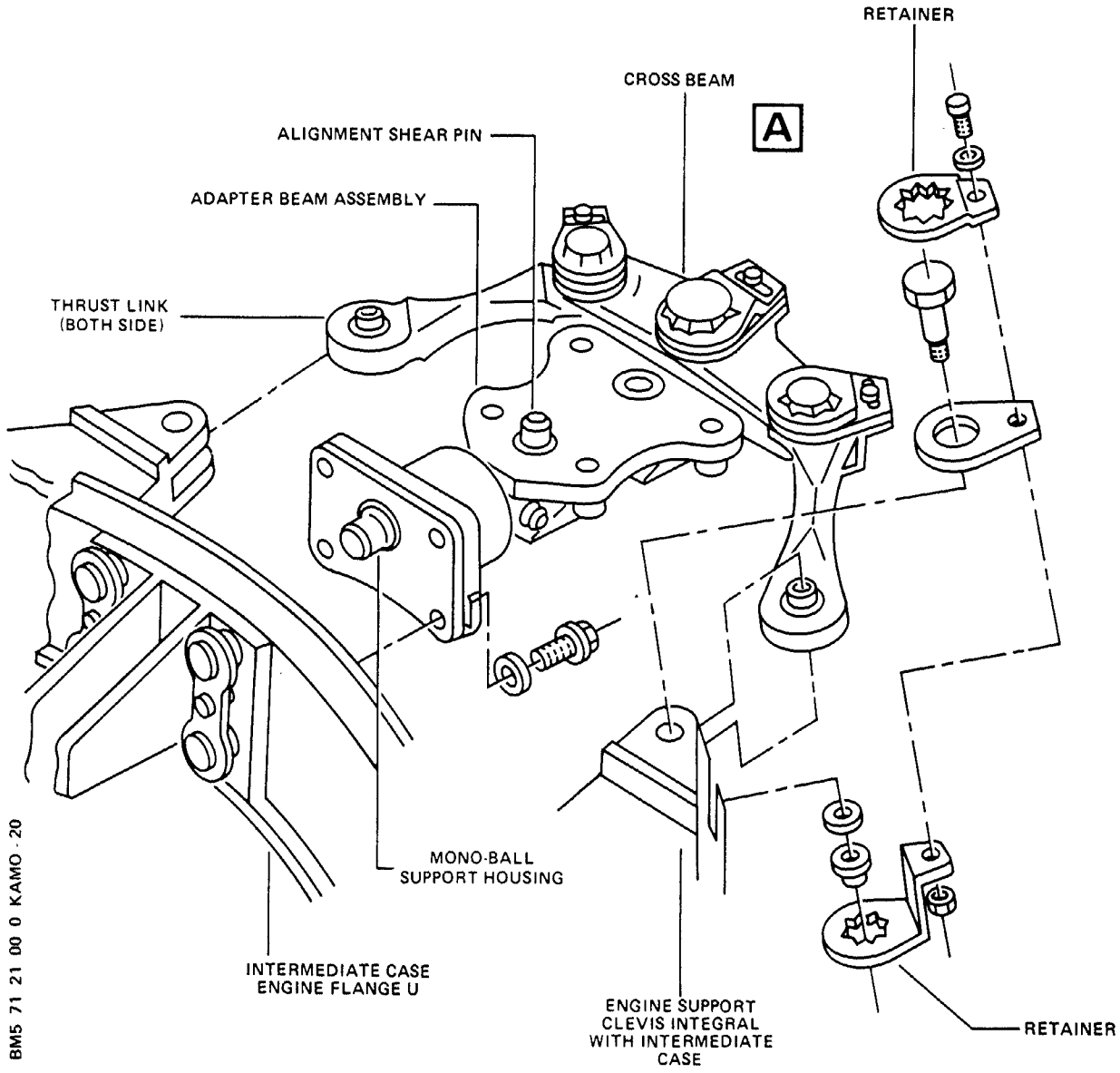
Engine Mounts and Handlings-Location
Figure 002

FORWARD MOUNT - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The forward mount takes side, vertical, and thrust loads.
   The mount consists of mono-ball support housing and two thrust links attached to the intermediate case aft flange.
   The mount is provided with an alignment shear pin. The pin mates with an alignment hole in a support attached between the two pylon forward mount trusses.
   The forward mount adapter beam attaches to the forward pylon mount and is secured by four bolts and self-locking nuts, which are held in place by retainers. The bolts are inserted through the mounting holes in the pylon trusses.





Engine Forward Mount
Figure 001

FORWARD MOUNT - REMOVAL/INSTALLATION

1. Equipment and Material

ITEM	DESIGNATION
A.	Torque Wrench, 0-50 lbf.in. (0.000-0.565 m.daN)
B.	Torque Wrench, 0-500 lbf.in. (0.000-5.65 m.daN)
C.	Torque Wrench, 0-500 lbf.ft. (0.000-67.79 m.daN)
D.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
E.	Methyl Isobutyl Ketone (MIBK)
F. Material No.P06-020	Lubricants (Ref. 70-00-00)
G. Material No.P09-001	Sealants (Ref. 70-00-00)
H. Material No.P18-009	Primer (Ref. 70-00-00)
Referenced Procedure - 71-00-00, P. Block 401	Power Plant - General

2. Procedure

A. Job-Set-Up
(1)Remove engine (Ref. 71-00-00, P. Block 401)

B. Removal (Ref. Fig. 401)
(1)Remove bolt (13), two washers (14), and nut (15) attaching retainer assembly (12) to each pair of forward support mount bolts (2).
(2)Remove four forward support bolts (2) and washers (3) attaching engine forward mount (1) to engine compressor intermediate case flange.
(3)Remove nuts (9), washers (8), bolts (7) and retainers (10) from two sets of fasteners attaching engine forward mount to engine support clevis assembly.
(4)Remove two bolts (4), washers (5) and nuts (6) attaching thrust struts to engine support clevis assemblies.
(5)Remove mount from engine.

C. Installation (Ref. Fig. 401)
CAUTION : FOR HIGH THRUST ENGINES A COMBINATION OF FORWARD ENGINE MOUNT COMPONENTS ARE REQUIRED TO BE INSTALLED TO MAINTAIN THE 40K FLIGHT CYCLE LIFE EXPECTANCY. SEE FORWARD ENGINE MOUNT COMPONENT MAINTENANCE MANUAL (REF. 71-20-04, P. BLOCK 700) (P&W PN 221-4049) FOR SPECIFIC PART NUMBER COMBINATIONS. ANY OTHER COMBINATION OF FORWARD ENGINE MOUNT MAIN BEAM AND CROSS BEAM WOULD REDUCE THE FLIGHT CYCLE CAPABILITY FROM 40K TO 20K FLIGHT CYCLES.
(1)Position mount (1) on engine.
(2)Apply molybdenum disulfide lubricant, Material No.P06-020 to shank and threaded area of bolts (4). Install bolts (4) and retainer lugs.

WARNING : METHYL ISOBUTYL KETONE (MIBK) IS FLAMMABLE AND VAPOR IS HARMFUL. USE IN A WELL-VENTILATED AREA. AVOID PROLONGED BREATHING OF VAPOR OR PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION OF EYES, NOSE, THROAT, AND SKIN. HIGH CONCENTRATIONS MAY CAUSE WEAKNESS, HEADACHE, NAUSEA, DIZZINESS, AND IMPAIRED JUDGMENT. PROTECTIVE GLOVES SHOULD BE WORN DURING USE. MAY CAUSE DERMATITIS BY REMOVING SKIN OILS. PRIOR TO USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(3)Clean all surfaces to be primed and sealed with a clean cloth dampened with MIBK. Wipe surface dry before solvent evaporates. (Ref. Fig. 401)

(4)Inspect the areas on the cross beam and thrust link which have been contacted by the edge of a retainer assembly. The following maximum wear is allowed:

(a)Any wear must be blended to a 10:1 ratio.

(b)The maximum depth after blending shall not exceed 0.060 in. (1.52 mm).

(5)Replace any link or crossbeam which exceeds the limits.

WARNING : MATERIAL No.P18-009 IS FLAMMABLE AND VAPOR IS HARMFUL. USE IN A WELL-VENTILATED AREA. WORK PERFORMED IN CONFINED AREAS REQUIRES THE USE OF ADDITIONAL FORCED MECHANICAL VENTILATION. AVOID BREATHING OF VAPOR OR PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION TO SKIN, EYES, NOSE, AND THROAT. HIGH CONCENTRATIONS MAY CAUSE IMPAIRED JUDGMENT. PROTECTIVE GLOVES SHOULD BE WORN DURING USE. MAY CAUSE DERMATITIS BY REMOVING SKIN OILS. PRIOR TO USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(6)Apply Material No.P18-009 to all surfaces by brushing on a thin even coating, being sure to extend the primer at least 0.250 in. (6.35 mm) beyond area to be sealed. Allow primer to dry a minimum of 20 minutes.

WARNING : USE MATERIAL No.P09-001 IN WELL-VENTILATED AREAS. WORK PERFORMED IN CONFINED AREAS REQUIRES THE USE OF ADDITIONAL FORCED MECHANICAL VENTILATION. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION OF EYES AND SKIN. PRIOR TO USE OF THIS PRODUCT, CAREFULLY READ THE APPLICABLE "MATERIAL SAFETY DATA SHEET" AND FOLLOW ALL LISTED SAFETY AND HEALTH PRECAUTIONS.

(7)Mix Material No.P09-001 in accordance with manufacturer's instructions and warnings until a homogeneous mixture is obtained.

(8)Rotate bolt and retainer assembly upper half to a normal position. Ensure no contact with cross beam, thrust link, or attach lug will result upon reinstallation of lower half of retainer assembly.

(9)Apply a liberal amount of Material No.P09-001 sealant to primed surface of attach lug or cross beam, and washer.

(10)Install washers (5) and nuts (6) attaching thrust struts to engine support clevis assemblies.

(a)During installation, observe run on torque required to turn nuts (6) on bolts (4) until a minimum of two bolt threads extend beyond nuts.

Check that run on TORQUE is between 18 and 100 lbf.in. (0.20 and 1.12 m.daN) with no axial loads applied.

(b) Replace any nuts not meeting specified run on torque value and repeat check.

(11) Position forward mount assembly (1) on engine compressor intermediate case aft flange.

(a) Install mount assembly with four bolts (2), four washers (3), and retainer assemblies (11). Position retainers under boltheads. TORQUE bolts to between 180 and 220 lbf.ft. (24.40 and 29.82 m.daN).

(b) Install two retainers (12) onto each pair of bolts (2) with bolt (13), two washers (14) and nut (15). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(12) TORQUE bolts (4) to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).

(13) Position top retainer (10) overbolt (4) and bottom retainer (10) over nut (6), and install bolt (7), washer (8), and nut (9).

(a) During installation, observe run-on torque required to turn nuts (9) on bolts (7) until a minimum of two bolt threads extend beyond nuts. Check that run-on TORQUE is between 2 and 10 lbf.in. (0.02 and 0.11 m.daN).

(b) Replace any nuts not meeting specified run on torque value and repeat check.

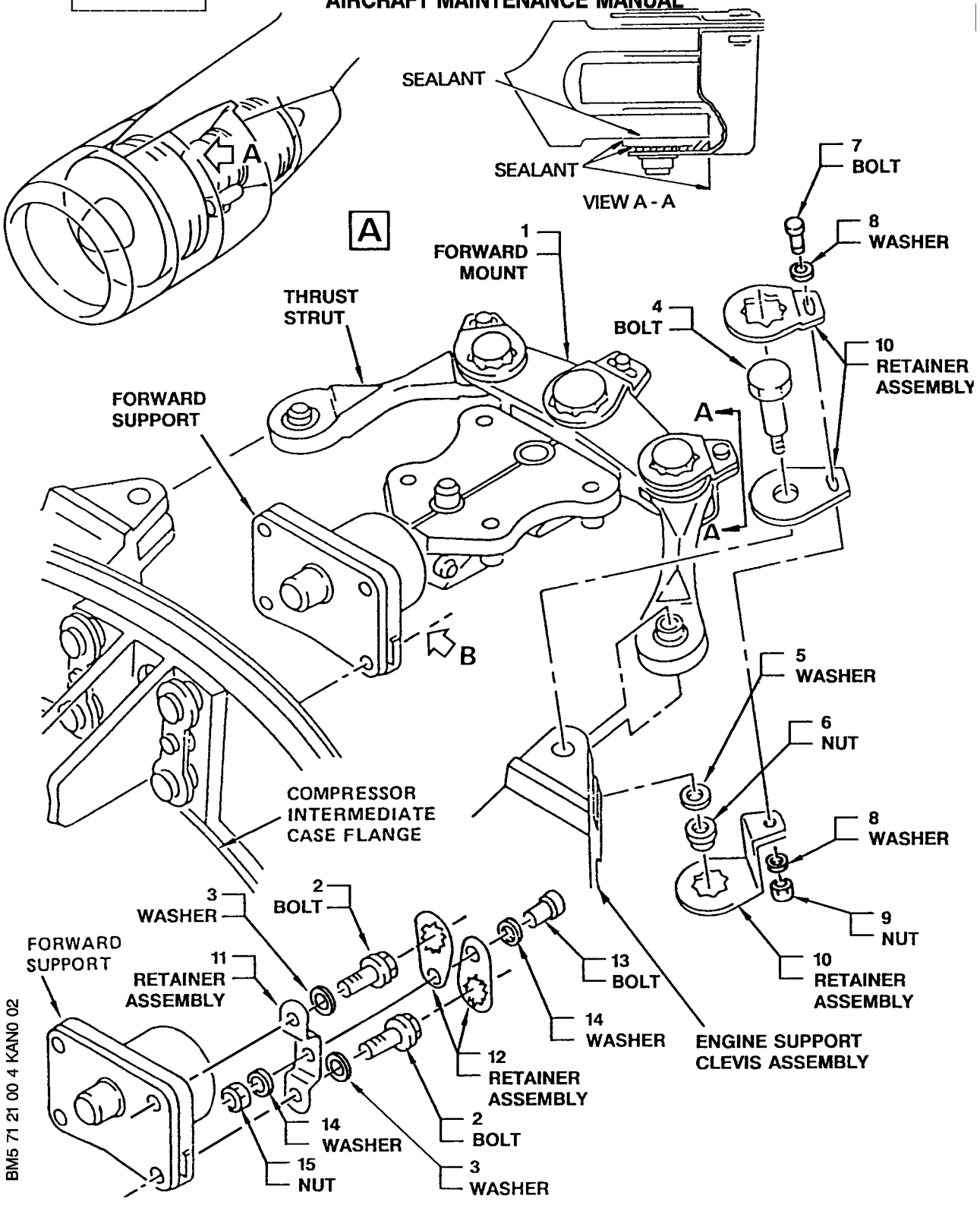
(14) TORQUE nuts (9) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(15) Apply a fillet of Material No.P09-001 sealant to fill gap between washer and retainer assembly lower half. Remove excess sealant using a clean cloth lightly dampened in MIBK solvent. Allow 24 hours cure time at 50 percent relative humidity, and 77°F plus or minus 5°F (25°C plus or minus 2.39°C).

NOTE : To accelerate curing allow sealant to gel a minimum of two hours at room temperature circulating warm air over the sealant and/or prewarming the structure. Do not exceed a temperature of 120°F (48.9°C).

D. Close-Up

(1) Install engine (Ref. 71-00-00, P. Block 401).



Engine Forward Mount
Figure 401

FORWARD MOUNT - INSPECTION/CHECK

1. Equipment and Materials

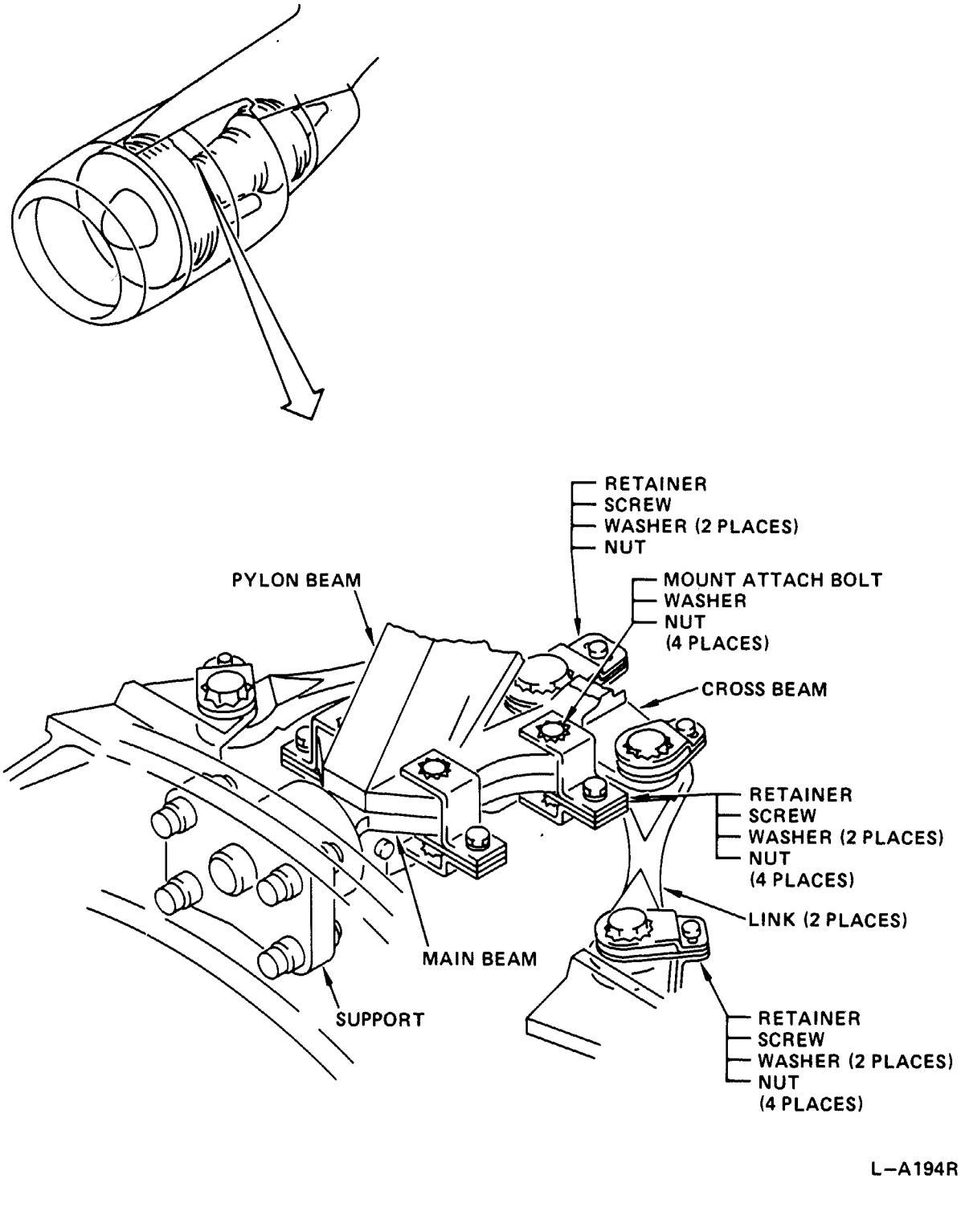
ITEM	DESIGNATION
A.	Torque Wrench
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Pratices
- 71-00-00, P. Block 401	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 71-21-00, P. Block 401	Forward Mount

2. Procedure (Ref. Fig. 601)

A. Job Set-Up
(1)Remove engine (Ref. 71-00-00, P. Block 401).

B. Inspection
(1)Visualy inspect the pylon to engine mount nuts in detail.
(2)Visualy inspect and inspect as per fluorescent penetrant inspection (SPOP70) (Ref. 70-00-00, P. Block 201) the pylon to engine bolts.
NOTE : Pre SB PW4NAC 71-77 main beams are rated at 20,000 cycles.
Post SB PW4NAC 71-77 main beams are rated at 40,000 cycles.
(3)Inspect forward mount cross beam, links, retainers and attaching hardware for satisfactory condition, security of attachment and corrosion. Replace mount if defects found (Ref. 71-21-00, P. Block 401).
(4)Inspect forward mount main beam, support, and attaching hardware for condition and security. Replace mount if defects found (Ref. 71-21-00, P. Block 401).
(5)Inspect forward mount attach bolts, nuts and retainers for condition and security. Replace bolts, nuts or retainers if defects found. TORQUE attach bolts to between 360 and 400 lbf.ft. (48.8 and 54.2 m.daN). Install retainers with bolt, washers and nut. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

C. Close-Up
(1)Install engine (Ref. 71-00-00, P. Block 401).



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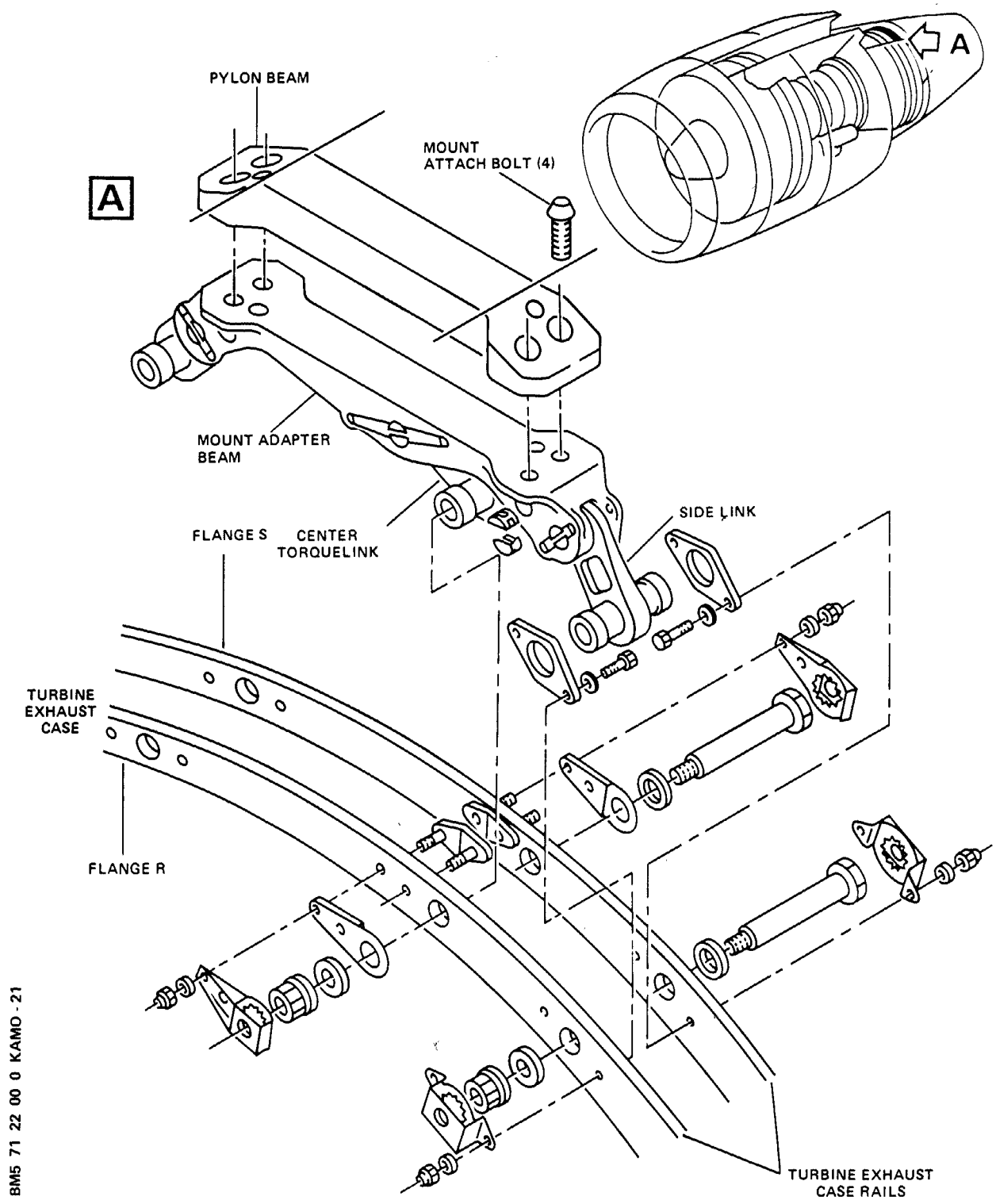
Forward Mount
Figure 601

AFT MOUNT - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The aft mount restrains engine movement in all directions except forward and aft. The unrestrained forward and aft movement compensates for thermal expansion of the engine. The mount is attached to two turbine exhaust case mount rails. The aft mount consists of an adapter beam, two side links and a center link :
   - The adapter beam consists of two halves that are bolted together. The adapter beam contains three staked bearing races and uniball bearings, which serve as attach points for the two side links and the torque link in the center.
   - Each link has staked bearing race and uniball bearing installed at each end.

   The engine aft mount adapter beam attaches to the pylon engine aft mount and is secured with bolts. To facilitate installation, two removable alignment shear pins are installed on the pylon engine aft mount. The pins mate with the alignment holes in the adapter beam.



Engine Aft Mount

Figure 001

AFT MOUNT - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Torque Wrench 0 to 750 lbf.in. (0 to 8.47 m.daN) Range
B. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedure - 71-00-00, P. Block 401	Power Plant - General

2. Procedure

A. Job Set-Up
(1)Remove engine (Ref. 71-00-00, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Remove eight bolts (3), washers (7), nuts (10), washers (8), plates (17), and retainers (14).
CAUTION : DO NOT ROTATE THE BOLT WHEN YOU REMOVE THE BOLT. ROTATION CAN CAUSE SCORING DAMAGE TO THE BOLT.
(2)Remove two outboard bolts (5), washers (9) and (6), and nuts (11).
(3)Remove four bolts (2), washers (8), nuts (18), plates (15) and (16), and retainers (12) and (13).
CAUTION : DO NOT ROTATE THE BOLT WHEN YOU REMOVE THE BOLT. ROTATION CAN CAUSE SCORING DAMAGE TO THE BOLT.
(4)Remove center bolt (4), washers (9) and (6), plates (15) and (16) and nuts (11).
(5)Remove mount (1).

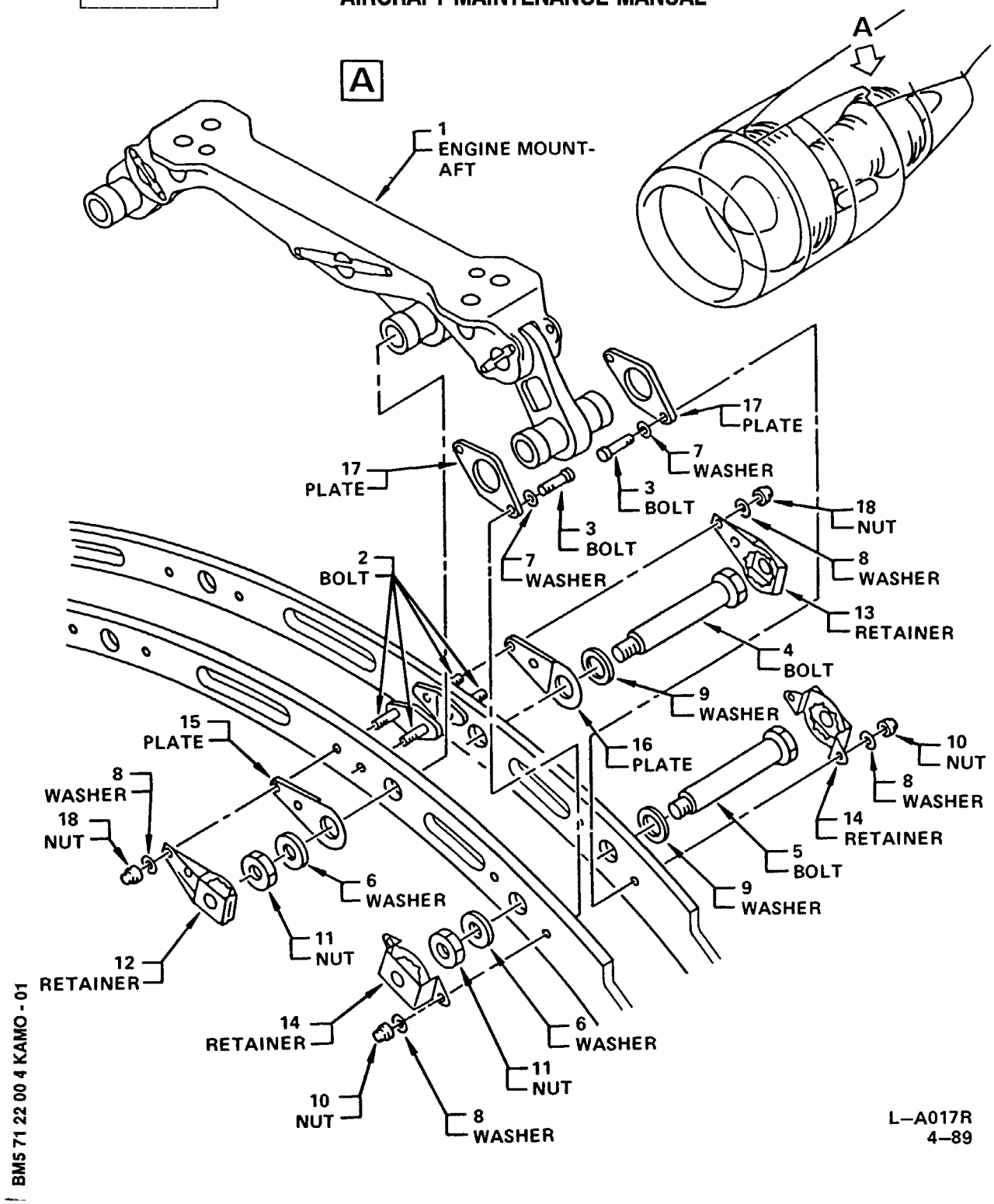
C. Installation (Ref. Fig. 401)

(1)Slide four plates (17) over ends of outboard mount bearings.
CAUTION : DO NOT ROTATE THE BOLT WHEN YOU INSTALL THE BOLT. ROTATION CAN CAUSE SCORING DAMAGE TO THE BOLT.
(2)Position engine aft mount (1) on engine and install center bolt (4), washer (9), plates (15) and (16), washer (6), and nut (11).
(3)Insert four bolts (2) through engine mount flanges and retaining plates (15) and (16) and hold bolts and plates in position temporarily with washers (8) and nuts (18).
(4)TORQUE nut (11) to between 250 and 300 lbf.in. (2.82 and 3.38 m.daN).
(5)Remove nuts (18) and washers (8) and install retainers (12) and (13). Reinstall washers (8) and nuts (18).
(a)During installation, observe run-on torque required to turn nuts (18) on bolts (2) until a minimum of two bolt threads extend beyond nuts. Check that run-on TORQUE is between 24 and 150 lbf.in. (0.27 and 1.69 m. daN) with no axial loads applied.
(b)Replace any nuts not meeting specified run-on torque value and repeat check.
(6)TORQUE nuts (18) to between 400 and 500 lbf.in. (4.52 and 5.64 m.daN).

CAUTION : DO NOT ROTATE THE BOLT WHEN YOU INSTALL THE BOLT. ROTATION CAN CAUSE SCORING DAMAGE TO THE BOLT.

(7)Install two outboard bolts (5), washers (9) and (6), and nuts (11) in outboard bearings.
(8)TORQUE nuts (11) to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(9)Install eight bolts (3) and washers (7) through plates (17) and engine mount flanges.
(10)Install four retainers (14) on bolts (3) with washers (8) and nuts (10).
(a)During installation, observe run-on torque required to turn nuts (10) on bolts (3) until a minimum of two bolt threads extend beyond nuts. Check that run-on TORQUE is between 24 and 150 lbf.in. (0.27 and 1.69 m.daN) with no axial loads applied.
(b)Replace any nuts not meeting specified run-on torque value and repeat check.
(11)TORQUE nuts (10) to between 400 and 500 lbf.in. (4.52 and 5.64 m.daN).

D. Close-Up
(1)Install engine (Ref. 71-00-00, P. Block 401).



Engine Aft Mount
Figure 401

AFT MOUNT - INSPECTION/CHECK

R 1. Equipment and Materials

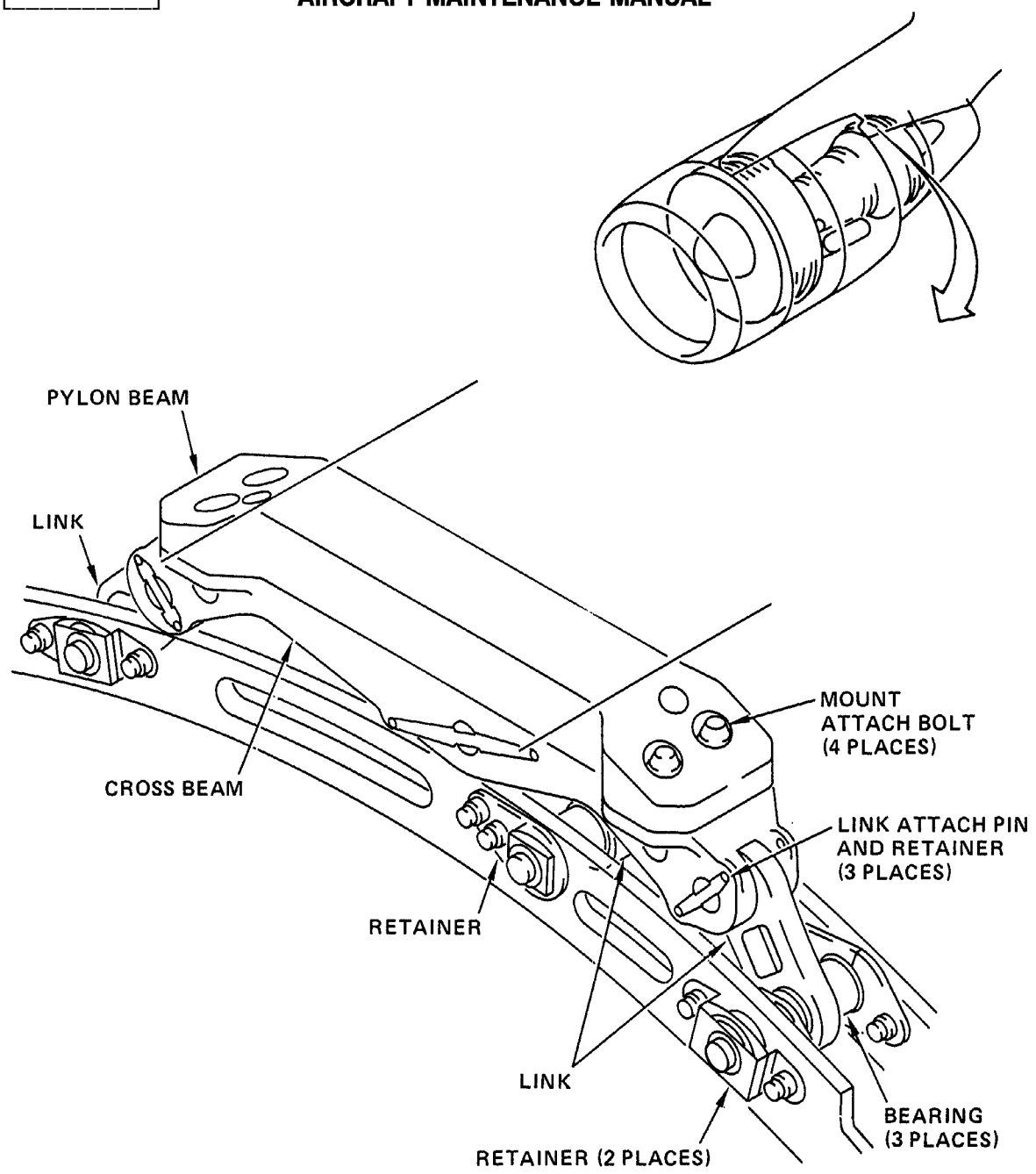
ITEM	DESIGNATION
A.	Torque Wrench
B.	Corrosion Resistant Steel Lockwire (MS 20995C47) (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-00-00, P. Block 401	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 71-22-00, P. Block 401	Aft Mount

2. Procedure (Ref. Fig. 601)

A. Job Set-Up
(1)Remove engine (Ref. 71-00-00, P. Block 401).

B. Inspection
(1)Using visual and fluorescent penetrant inspection (SPOP70), (Ref. 70-00-00, P. Block 201) inspect pylon to engine mount bolts and nuts in detail.
(2)Inspect engine mount links, link attach pins and retainer bearings, nuts, bolts, retainers, and attaching hardware for satisfactory condition, security of attachment and corrosion. Replace mount if defects found (Ref. 71-22-00, P. Block 401).
(3)Inspect engine mount cross beam for condition and security. Replace mount if defects found. (Ref. 71-22-00, P. Block 401).
(4)Inspect engine mount attach bolts and lockwire for condition and security. Replace bolts if defects found. TORQUE bolts to between 360 and 400 lbf. ft. (48.8 and 54.2 m.daN) and wirelock. If lockwire found defective, remove lockwire, check attach bolt TORQUE and wirelock.

C. Close-Up
(1)Install engine (Ref. 71-00-00, P. Block 401).



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Aft Mount
Figure 601

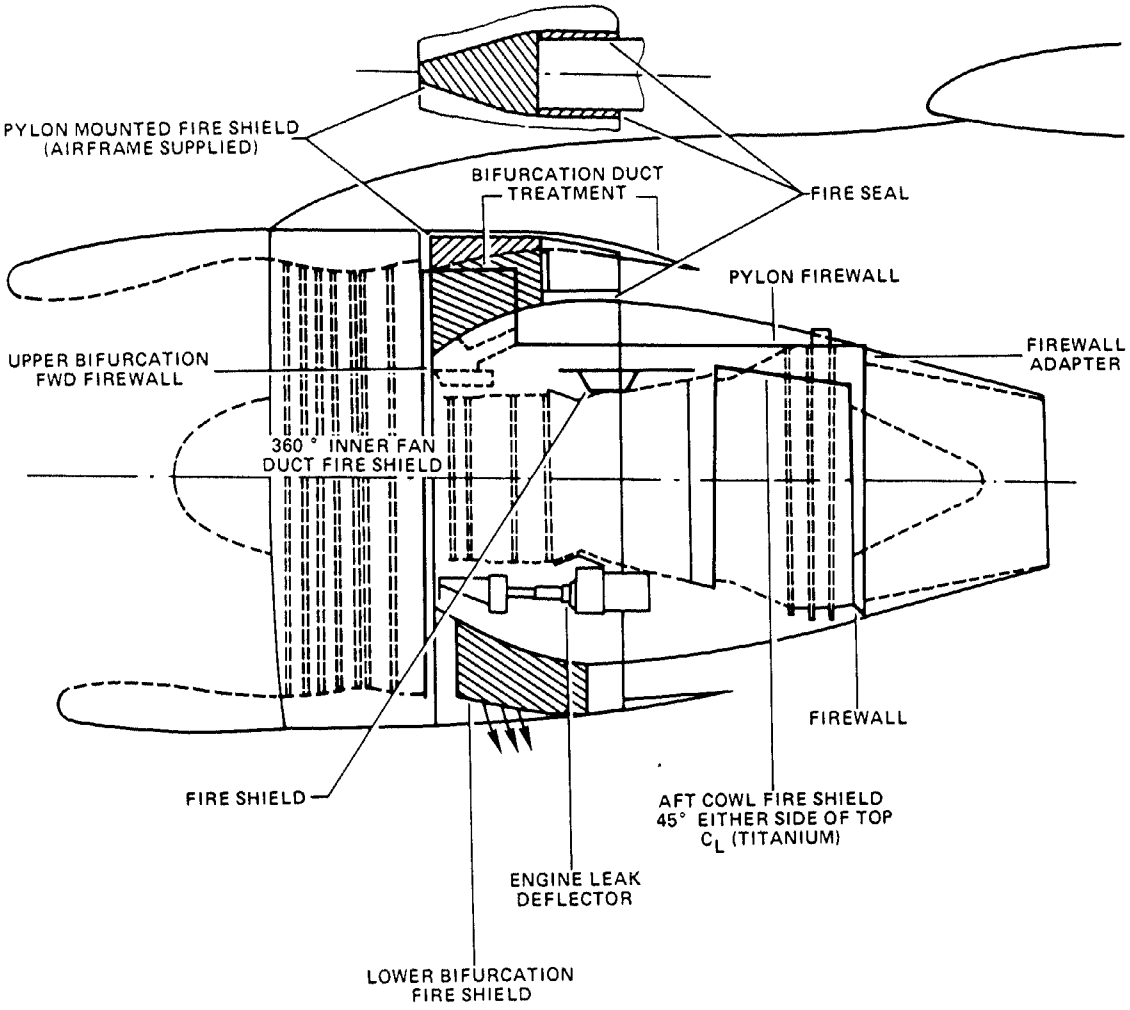
FIRE SEALS - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001, 002)
The lower bifurcation fire wall with fire seal is a fireproof bulkhead or barrier between the fan cowl compartment and the engine core compartment which prevents spread of fire. The fire wall with fire seal is located below the engine core just aft of the fan case. When the thrust reverser doors are closed, the fire seal on the fire wall forms an airtight seal between the fan case and the engine core case.

2. Description And Operation

A. The general functions of the fire seal are as follows :
(1)Prevents entry of combustible matter into areas where auto-ignition may occur and prevents propagation of fire.
(2)Confines major leaks resulting from pneumatic duct and tubing rupture.
(3)Prevents movement of air from hot section of engine core to fan case area.
(4)Facilitate the effective use of the fire detection system by containing the fire in one area.

B. The fire seal is a one-piece, hexagonal, crushable seal installed on the circumference to the bifurcation fire wall with six flat straps and twelve screws.



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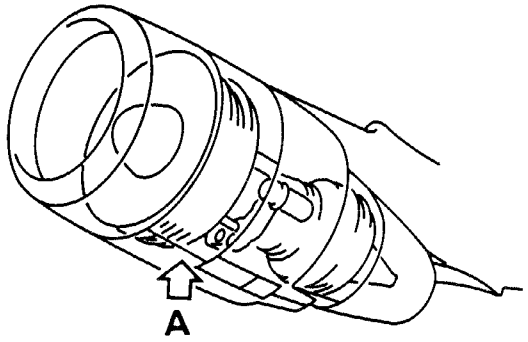
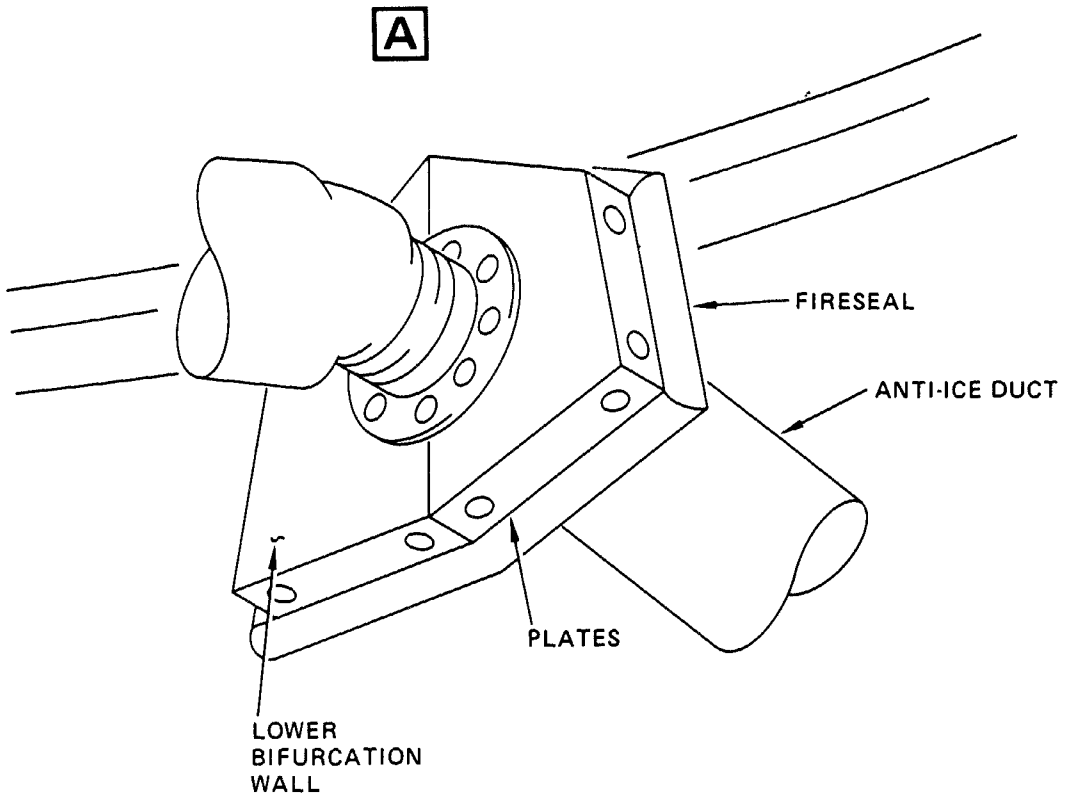
Fire seals - Location
Figure 001





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Fire Seals - Location
Figure 002

BIFURCATION FIRE SEAL - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Fire Seal
C.	24-32 lbf.in. (0.27 - 0.36 m.daN)
D.	Protective Covers
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

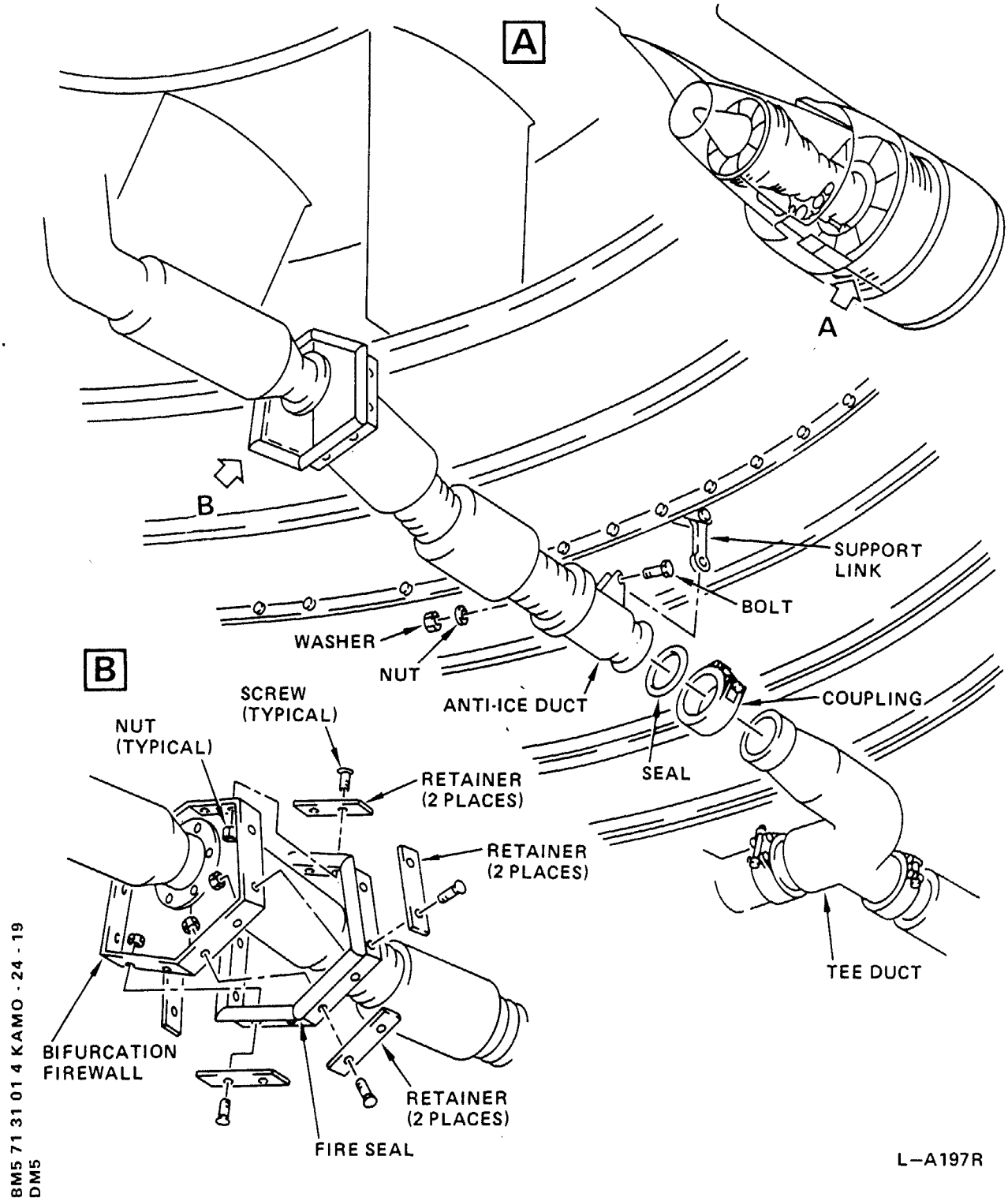
2. Procedure

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1) Remove nuts, screws, and retainers attaching bifurcation fire seal to circumference of firewall.
(2) Remove coupling and seal connecting anti ice duct to tee duct.
(3) Remove nut, washer, and bolt attaching anti ice duct to support link and slide fire seal over end of anti ice duct. Discard fire seal. Temporarily secure duct to fan case.
(4) Install protective covers on ducts.

C. Installation (Ref. Fig. 401)
(1) Release temporarily secure anti ice duct and slide bifurcation fire seal over duct into position on bifurcation firewall.
(2) Remove protective covers from ducts and install seal and coupling connecting anti ice duct to tee duct. Torque coupling to value indicated on coupling band.
(3) Attach anti ice duct to support link with bolt, washer, and nut.
(4) Install fire seal on circumference of bifurcation firewall with retainers, screws, and nuts. TORQUE nuts to between 24 and 32 lbf.in. (0.27 and 0.36 m.daN).

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close thrust reverser doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



Bifurcation Fire Seal
Figure 401

BIFURCATION FIRE SEALS - INSPECTION/CHECK

1. Examine Bifurcation Fire Seals

A. General
(1) This procedure provides instructions to examine the bifurcation fire seals.

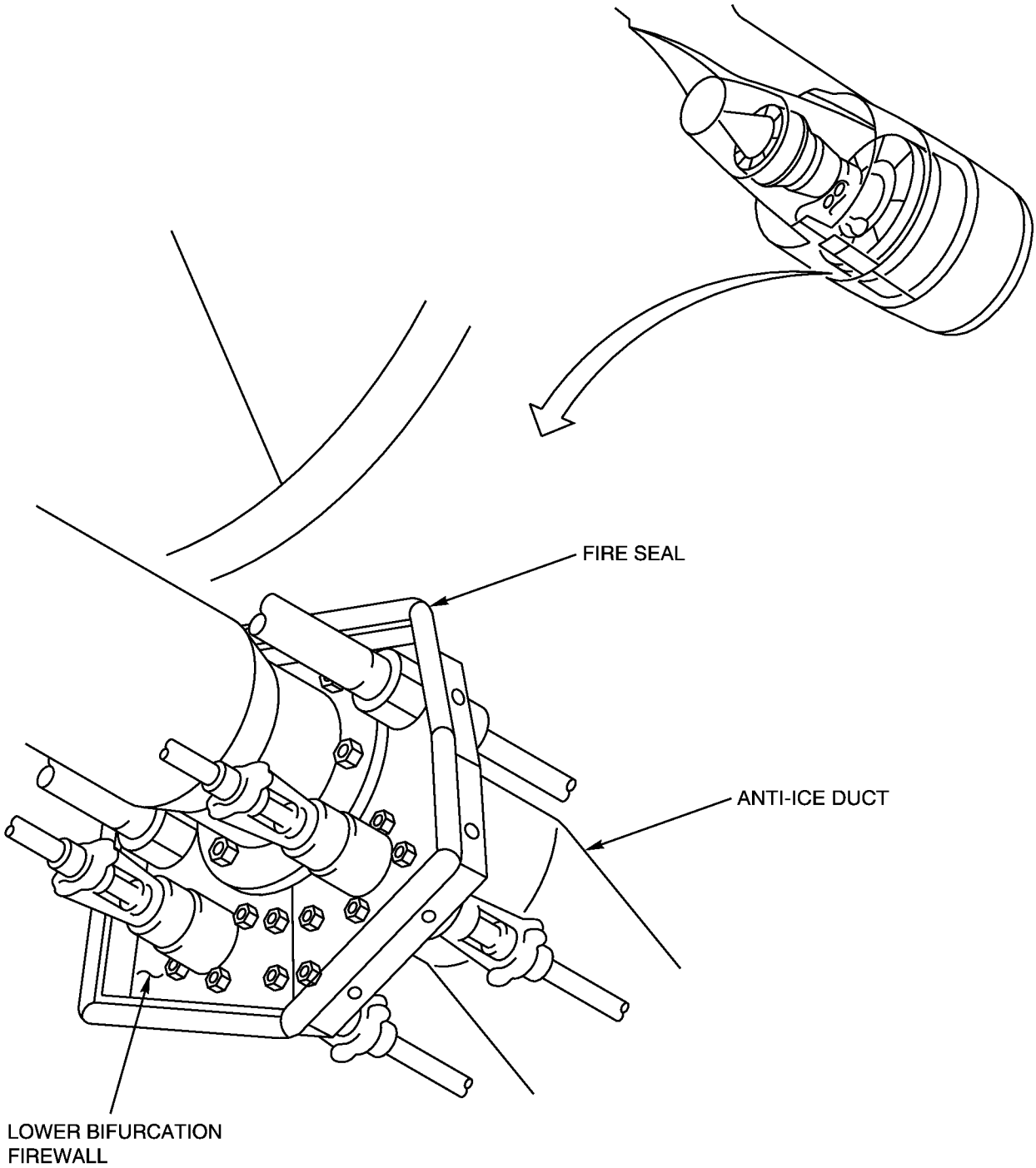
B. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

C. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open applicable fan cowl and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure (Ref. Fig. 601)
(1) Visually examine all fire seals for cuts, aging, deterioration, frayed, depressed or flattened areas. Replace if damaged. Do not remove seal until stock availability is verified.

E. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(3) Remove safety clips and tags and close circuit breakers.



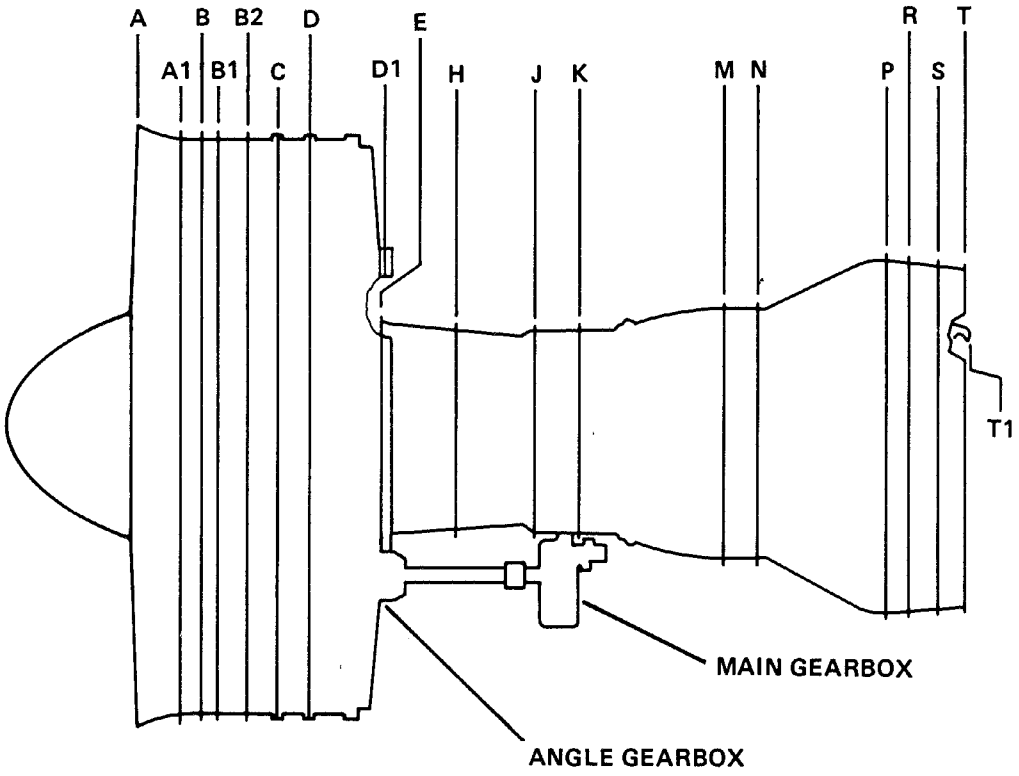
Bifurcation Fire Seals
Figure 601

ATTACH FITTINGS - DESCRIPTION AND OPERATION

1. Flange Identification (Ref. Fig. 001)

A. Engine Flanges
- A-B FAN CASE
- B-C FAN EXIT FRONT CASE
- E REAR COMPRESSOR VARIABLE INLET GUIDE VANE CASE
- H 6TH STAGE (VARIABLE) STATOR VANE CASE
- H-J 7TH STAGE (VARIABLE) STATOR VANE CASE
- J-K REAR COMPRESSOR CASE
- K-M DIFFUSER/COMBUSTION CASE
- M-N REAR COMPRESSOR DRIVE TURBINE CASE
- N-P FRONT COMPRESSOR DRIVE TURBINE CASE
- P-T TURBINE EXHAUST CASE
- T1 TURBINE EXHAUST CASE

B. Surface Flanges
- A1 FAN CASE
- B1 FAN EXIT FRONT CASE
- B2 FAN EXIT FRONT CASE
- D FAN EXIT REAR CASE
- D1 INNER AREA FAN EXIT REAR
- R-S TURBINE EXHAUST CASE (LOCATION REAR ENGINE)



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Flange Identification
Figure 001

ELECTRICAL HARNESS - DESCRIPTION AND OPERATION

1. General

The electrical harnesses in the nacelle are fire resistant, and distribute the power required by the various aircraft and engine components in order to supply :

- the control systems
- the indicating systems
- the transmission of signals provided by various sensors.

Two groups of harnesses are provided on the engine :

- the fan case electrical harnesses, located on the forward flanges of the fan case, both left and right sides, are attached to components with standard electrical connectors and receptacles, and are connected to the left and right forward pylon junction box (Ref. Fig. 001, 002)
- the core electrical harnesses, located on the core zone, both left and right sides, are attached to the various components with standard electrical connectors and receptacles, and are connected to the aft pylon junction box (Ref. Fig. 003).

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R

2. Description and Operation

A. See table 1 for electrical harness identification numbers, electrical connector numbers, attaching components, connectors, and interface routes.

Electrical Harness	Connector Wire Number	Attachment
21W4058	D5005J	W1P13, nose cowl interface to DH11B.
	DH11B	P2T2, Sensor A
21W4060	D4975J	Ground Jack
	GD9970	Ground Jack
21W4062	D4969J	D4969P, interface to D4974J, interphone jack.
	D4974J	Interphone Jack
21W4066	D4965J	D4965P, interfaces DH11A, nose cowl, to P2-T2 probe.
	DH11A	P2T2 Channel B and P2T2 heater
	D5004J	W2P13, interfaces to DH11A, nose cowl, to P2-T2 probe.
21W4068	D4969P	P4969J, nose cowl interface to interphone jack, D4974J.
	D4965P	D4965J, (D4965P/D4965J, interface to P2-T2 probe).

Electrical Harness	Connector Wire Number	Attachment
	D4970P	Nose cowl to A/C and RH interface (fan area pylon interface).
	D5053P	Nacelle Cooling Interface (Post SB PW4ENG 78-40).
	D5054P	D5054J, interface to RH thrust reverser synchronous shaft lock.
	D5055P	D5055J, interface to LH thrust reverser synchronous shaft lock.
21W4069-501	D5054J	DH16 LH thrust reverser synchronous shaft lock.
	D5055J	DH17 RH thrust reverser synchronous shaft lock.
21W4070	D4955P	Core area pylon interface.
	070001-00N	Ground Stud
	070002-00N	Integrated Drive Generator
	070003-00A	Integrated Drive Generator
	070004-00B	Integrated Drive Generator
	070005-00C	Integrated Drive Generator
21W4072	Core Area, misc.	
	DT595	Core compartment temperature sensor (T595).
	DT581	Fuel pressure transmitter.
	DH10	Fuel condition actuator.
	DV216	IDG AOC valve (V216).
	D4991P	Fuel pump
	DT580	Fuel flow transmitter.
	DT597	Number 3 bearing oil temperature.
	DV215	Starter control valve.
	DV214	Hydraulic pump electrical disconnect valve, right (Pre SB PW4ENG 71-70) Hydraulic pump electrical disconnect valve, left (Post SB PW4ENG 71-70).
	DH8	Ignition exciter, lower.
	DH7	Ignition exciter, upper.

Electrical Harness	Connector Wire Number	Attachment
	DS298	IDG, AOC pressure switch (S298).
	GD9957	DC ground.
	GD9951	DC ground
	GD9960	DC ground
	GD9954	AC ground for D4952P, pin S.
	GD9942	DC ground for D4952P, Pin J.
	D4961P	To H29, temperature sensor high-stage.
	D4956P	Core, pylon interface.
	D4952P	Interface from category IV - core.
	DV225A	High pressure bleed control valve.
	DV225B	High pressure bleed control valve.
	DV225C	High pressure bleed control valve.
	DV224A	Engine pneumatic regulator (aramature).
	DV224B	Engine pneumatic regulator (contacts).
	H29-A	Temperature H29 high-stage sensor to D4961P.
	H29-C	Temperature H29 high-stage sensor to D4961P.
	DT584	Oil quantity transmitter.
	DT582	Oil temperature sensor.
	DT583	Oil pressure transmitter.
	GD9953	DC ground.
	GD9947	DC ground.
	GD9956	DC ground.
	GD9958	DC ground.
	GD9959	DC ground.

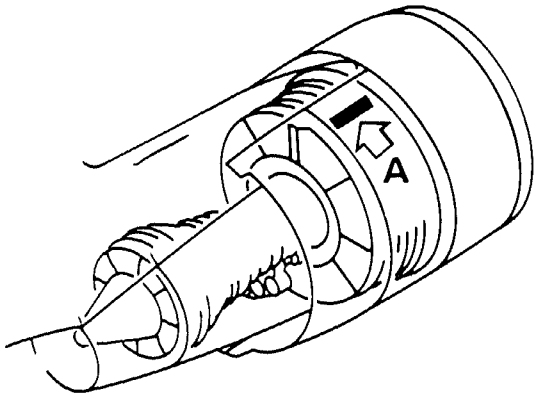
Electrical Harness	Connector Wire Number	Attachment
	DS299	Oil filter differential pressure switch.
	DS297	Low oil pressure switch.
	DV213	Hydraulic pump electrical disconnect valve, left. (Pre SB PW4ENG 71-70). Hydraulic pump electrical disconnect valve, right. (Post SB PW4ENG 71-70).
21W4075	Wire Harness Assembly, Thrust Reverser, Junction Box (Post SB PW4 NAC 71-100).	
	D4966P	Interface to RH pylon interface
	D5010P	D5010J, T/R switch circuit junction box.
21W4076	Wire Bundle Assembly, T/R Control	
	D4986J	D4986P, to S307, LH stow/deploy switch and S306, LH second lock switch.
	D4987J	D4987P, to S301, RH stow/deploy switch and S302, second lock switch.
	D4966P	Interface to RH pylon interface (Pre SB PW4NAC 71-100).
	D5006P	D5006J, T/R switch circuit junction box.
	D5010P	D5010J, T/R switch circuit junction box (Pre SB PW4NAC 71-100).
	D5007P	D5007J, T/R switch circuit junction box.
	D5051P	Nacelle cooling interface (Post SB PW4ENG 78-40)
21W4078	Wire Harness Assembly, FADEC and RVDT Junction Box.	
	D5022J	D5022P, (D5022P/D5022J interface Channel A input to EEC/RVDT junction box).
	D5021J	D5021P (D5021P/D5021J interface Channel A input to EEC/RVDT junction box).
	D4997J	W1P30 P & W, (W1P30/D4997J interface to FADEC/RVDT junction box).
	D4996J	W2P30 P & W, (W2P30/D4996J interface to FADEC/RVDT junction box.
	D5003j	D5003P
	D5002J	D5002P, (D5002P/D5002J interface to FADEC/RVDT junction box).
	D5020J	D5020P, Channel B input interface to FADEC/RVDT junction box.
21W4080	Wire Harness Assembly STW/DPLY/LOCK (R T/R)	
	D4987P	D4987J, interface to DS301, DS302 and DV228
	DS301	RH master actuator (stow/deploy switch).
	DS302	RH master actuator (RH secondary lock switch).

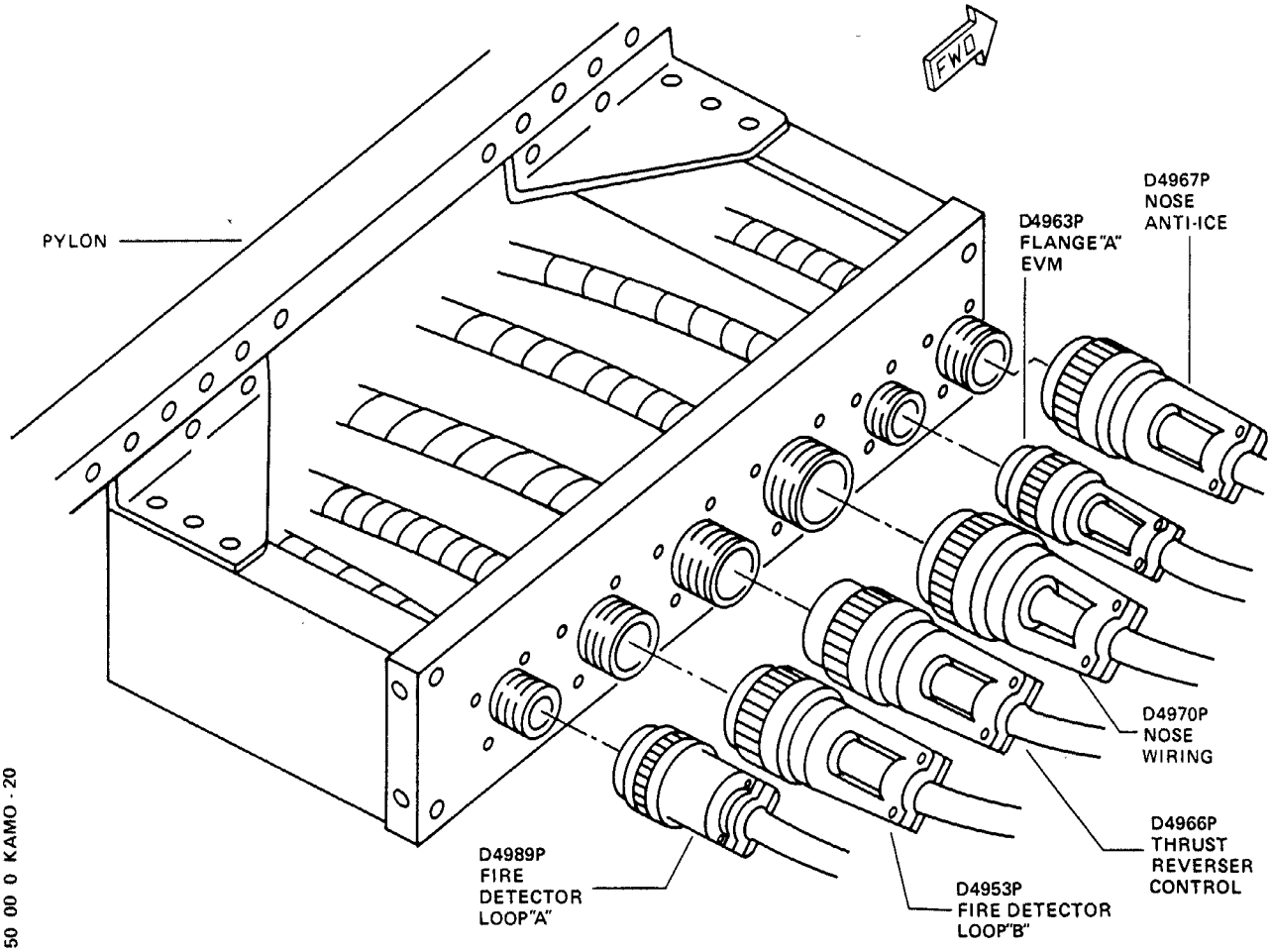
Electrical Harness	Connector Wire Number	Attachment
	DV228	RH Thrust Reverser stow/deploy/lock switch
21W4082	Wire Harness Assembly STOW/DEPLOY/LOCK, Left Thrust Reverser.	
	D4986P	D4986J, (D4986P/D4987J interface to stow/ deploy switch, DS307, LH master actuator).
	DS306	LH secondary lock switch (LH master actuator).
	DS307	Stow/deploy switch (LH master actuator).
	DV227	Nacelle Cooling interface (Post SB PW4ENG 78-40)
21W4083	Wire Harness Assembly, Baroswitch (Post SB PW4ENG 78-40)	
	D5052P	Nacelle Cooling Baroswitch Interface
	D5308	Nacelle Cooling Baroswitch Interface
21W4114	Wire Harness Assembly, Integrated Drive Generator (IDG) Control.	
	D4954P	Core area pylon interface.
	D4958P	Core area pylon interface.
	DG13A	IDG, input speed, disconnect solenoid, generator.
	DG13B	IDG, PMG, oil in temperature, charge pressure, oil out temperature.
21W4116	Harness Assembly, Inlet Anti-Ice.	
	D4967P	RH fan pylon interface.
	GD9965	DC ground.
	DS300	Nose cowl anti-ice air pressure switch (S300).
	DV220	Nose cowl anti-ice valve.
21W4118	Wire Bundle Assembly, FADEC, B Channel	
	D5000P	J1, FADEC Channel B (secondary).
	D5021P	D5021J, (D5021P/D5021J interface to FADEC/RVDT junction box.
	D4998P	Aircraft wiring, interface Fan input Channel A.
21W4120	Wire Bundle Assembly, FADEC, A Channel	
	D499P slet	To aircraft wiring, interface, Fan input Channel A.
	D5020P	D5020J, FADEC/RVDT junction box.
	D5022P	D5022J, FADEC/RVDT junction box.
	D5001P	J5, FADEC Channel A (primary).
21W4122	Wire Harness Assembly, Systron-Donner Fire Detector to firewall, Left Thrust Reverser.	
	D5016J	D5016P, core fire detector loop A/B LH side.

Electrical Harness	Connector Wire Number	Attachment
	GD9971	DC ground.
	DH2 LOOP B	Core fire detector LH side.
	DH1 LOOP A	Core fire detector LH side.
21W4124	Wire Harness Assembly, Systron-Donner Fire Detector to firewall, Right Thrust Reverser.	
	D5017J	D5017P, core fire detectors A/B RH side.
	DH3 LOOP A	Core fire detector RH side.
	DH4 LOOP B	Core fire detector RH side.
	GD9972	DC ground.
21W4132	Wire Harness Assembly, RVDT (R SWING).	
	D5002P	D5002J, FADEC/RVDT junction box.
	D5008J	D5008P, RH thrust reverser RVDT, stow/deploy switch assembly.
21W4140	Wire Bundle Assembly, T/R PDU and SLV - VLV	
	D5011P	D5001J, T/R switch circuit junction box.
	DH9	Regulator and shut-off valve (lower LH fan case).
	DS304	Brake switch, LH fan case.
	DH15	Selector valve (lower, LH, fan case).
21W4142	Harness Assembly, T/R Switch Wiring, J-Box.	
	D5011J	D5011P, (D5011P/D5011J interface to T/R switch circuit junction box).
	D5006J	D5006P, (D5006P/D5006J interface to T/R switch circuit junction box).
	D5010J	D5010P, (D5010P/D5010J interface to D4966P/RH pylon interface).
	D5007J	D5007P, (D5007P/D5007J interface to T/R switch circuit junction box and D4987P/D4987J).
21W4144	Wire Harness Assembly, RVDT (R T/R)	
	D5008P	D5008J, Interface to EEC/RVDT junction box.
	D5012P	Channel A, RH thrust reverser sleeve RVDT (stow/deploy switch assembly).
	D5013P	Channel B signal RH thrust reverser sleeve RVDT.
21W4146	Wire Harness Assembly, RVDT (L T/R)	
	D5003P	D5003J, FADEC/RVDT junction box.
	D5014P	Channel A signal LH thrust reverser sleeve RVDT and stow/deploy switch assembly.

Electrical Harness	Connector Wire Number	Attachment
	D5015P	Channel B signal LH thrust reverser sleeve RVDT.
21W4148	Wire Harness Assembly, Fire Detector Systron-Donner Firewall to Engine, L T/R.	
	D5016P	D5016J, lower bifurcation fire wall LH thrust reverser door.
	D5018P	D5018J, LH swing loop disconnect bracket.
21W4150	Harness Assembly, Fire Detector Systron-Donner engine to pylon.	
	D5018J	D5018P, LH swing loop disconnect bracket.
	D5019J	D5019P, RH swing loop disconnect bracket.
	D4953P	RH fan area pylon interface.
	D4989P	RH fan area pylon interface.
21W4152	Wire Harness Assembly, Fire Detector (Systron-Donner or Graviner), firewall to engine, R T/R.	
	D5019P	D5019J, RH swing loop disconnect bracket. (Fire detector).
	D5017P	D5017J, lower bifurcation firewall, RH thrust reverser door. (fire detector).
21W4160	Wire Harness Assembly, Fire Detector to Firewall (R T/R)	
	D5018P	D5018P, LH swing loop disconnect bracket.
	DH2 Loop B	Core fire detector LH side
	DH1 Loop A	Core fire detector LH side
	GD9971	DC ground
21W4161	Wire Harness Assembly, Fire Detector to Firewall (L T/R)	
	D5019P	D5019J, RH swing loop disconnect bracket.
	DH3 Loop A	Core fire detector RH side
	DH4 Loop B	Core fire detector RH side
	GD9972	DC ground

Table 001





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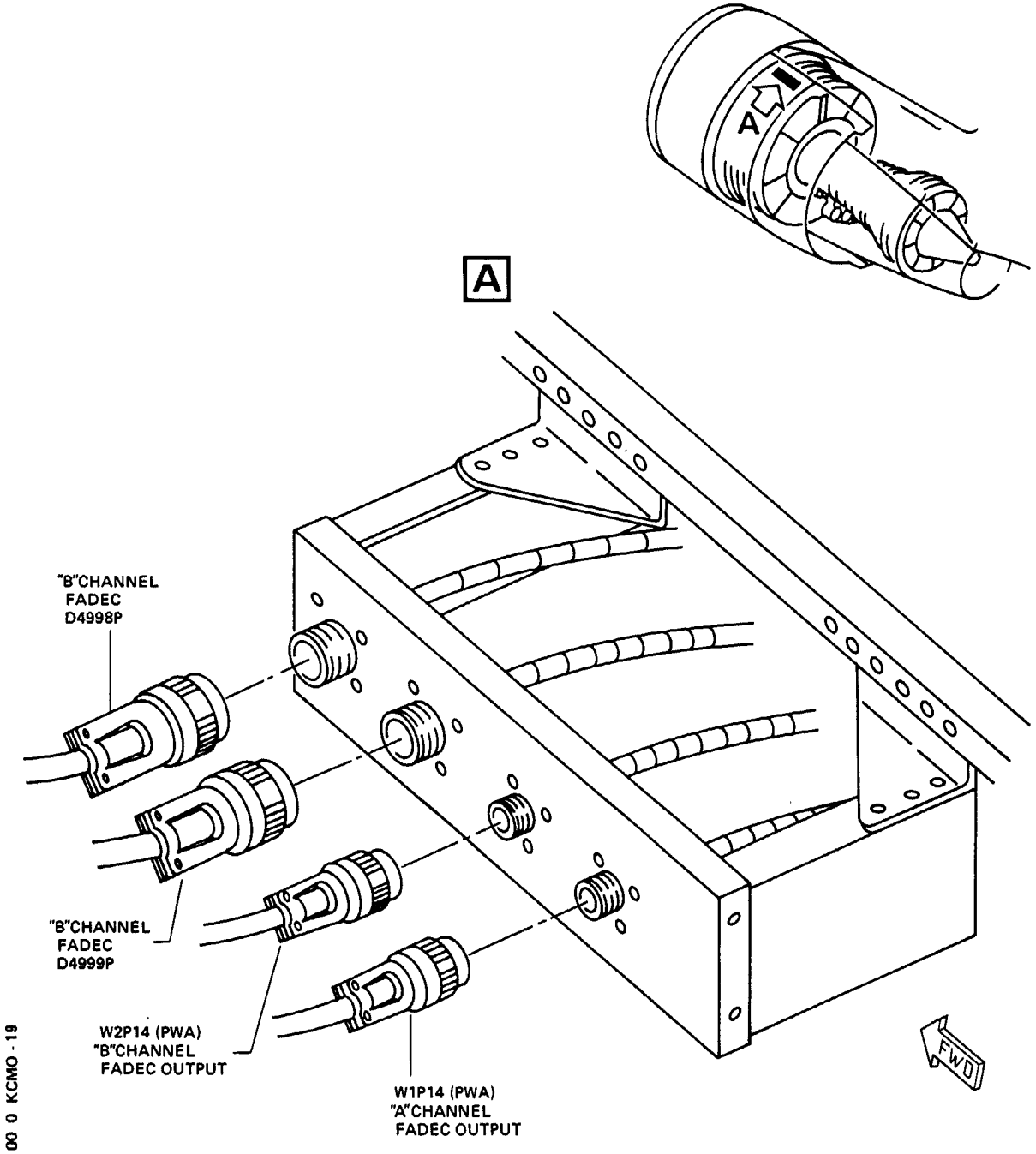
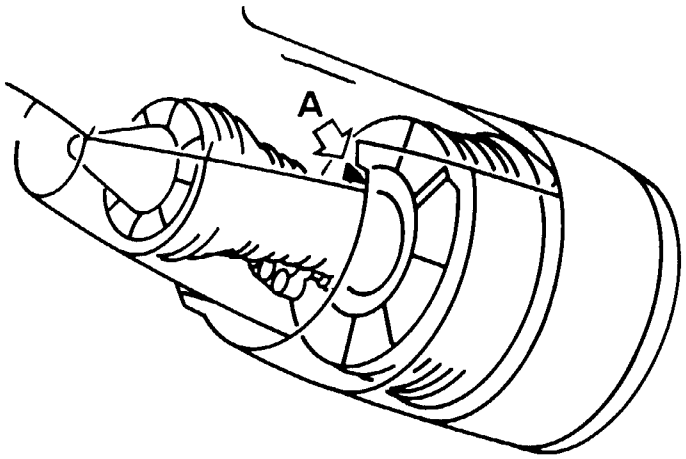
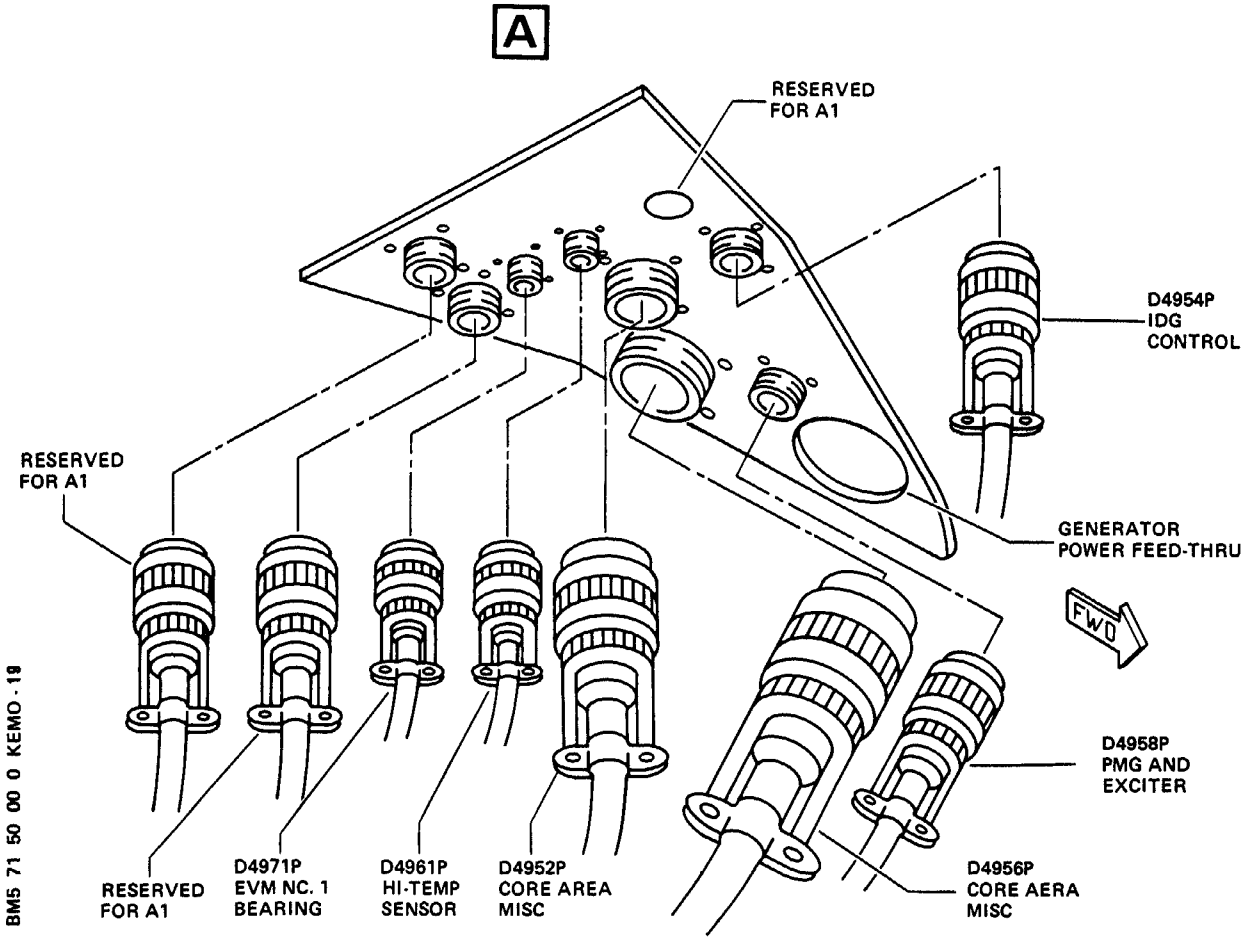
Right Forward Junction Box
Figure 001



Left Forward Junction Box
Figure 002





Aft Junction Box
Figure 003

ELECTRICAL HARNESS - INSPECTION/CHECK

1. Wire Harness Visual Inspection

A. Reason for the Job

NOTE : This procedure is applicable to all power plant electrical wire harnesses except externally braided cables, engine No. 1 (and No.2).

(1)This procedure provides the information necessary to accomplish the wire harness visual inspection.

B. Equipment and Materials

ITEM	DESIGNATION
(1)	Warning Notice
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

C. Job Set-Up

(1)On the starting panel
Put a warning notice to tell persons not to start the engine 1 (2).

(2)Make sure that the engine 1 (2) has been shut down for at least 5 minutes.

(3)On the appropriate panel make sure that all electrical power is shut off to the engine 1 (2). Install a warning notice.

(4)Open the fan cowl and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure

(1)Cable visual inspection

(a)Inspect all the cables in the harness for damage to the outer coating and braid.

(b)Inspect the wires for chafing, cuts, abrasions or damage.

(2)Connector visual inspection

(a)Inspect the connector for looseness and make sure the coupling nut is positioned to permit proper contact between mating pins and sockets.

(b)Disconnect the connectors as necessary to make sure the contacts are not bent or damaged and are properly seated in the connector.

(3)Repair the damaged parts (Ref. 20-71-00, Aircraft Wiring Manual).

(4)Connect all the connectors and secure.

E. Close-Up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove the warning notices.

(3)Reactivate the appropriate electrical system.

2. Wire Continuity Check

A. Reason for the Job

NOTE : This procedure is applicable to all power plant electrical wire

harnesses except externally braided cables, engine No.1 (and No.2).

(1)This procedure provides the information necessary to accomplish a contact pin (or socket) to contact pin (or socket) electrical wire continuity check.

B. Equipment and Materials

ITEM	DESIGNATION
(1)	Digital Multimeter Model 160B
(2)	Ohmmeter Model 260 or equivalent
(3)	Warning Notice
Referenced procedure - 71-13-00, P. Block 301	Cowl Doors

C. Job Set-Up

(1)On the starting panel
Put a warning notice to tell persons not to start the engine 1 (2).

(2)Make sure that the engine 1 (2) has been shut down for at least 5 minutes.

(3)On the appropriate panel make sure that all electrical power is shut off to the engine 1 (2). Install a warning notice.

(4)Open the fan cowl and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure

(1)Disconnect the two connectors of the wire harness which contains the cable of the circuit to be checked.

(2)Wire continuity check

(a)Do a wire continuity check on the suspect contacts/wire from point-to-point (end to end). Use a Model 160B Digital Multimeter or a Model 260 ohmmeter or equivalent.

(b)Each circuit must have continuity from one end of the wire to the other end of the wire.

(c)Defective circuits must be repaired (Ref. 20-71-00, Aircraft Wiring Manual).

(3)Connect all the connectors and secure.

E. Close-Up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove the warning notices.

(3)Reactivate the appropriate electrical systems.

3. Insulation Resistance and Shorted Wire Check

A. Reason for the Job

NOTE : This procedure is applicable to all power plant electrical wire harnesses except externally braided cables, engine No.1 (and No.2).

(1)This procedure provides the information necessary to accomplish an

insulation resistance check and a shorted wire check.

B. Equipment and Materials

ITEM	DESIGNATION
(1)	Model 1863 Megohmmeter or equivalent
(2)	Warning Notice
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

C. Job Set-Up

(1) On the starting panel
Put a warning notice to tell persons not to start the engine 1 (2).

(2) Make sure that the engine 1 (2) has been shut down for at least 5 minutes.

(3) On the appropriate panel make sure that all electrical power is shut off to the engine 1(2). Install a warning notice.

(4) Open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure

CAUTION : YOU MUST DISCONNECT ALL THE CONNECTORS WHICH HAVE A RELATION TO THE CIRCUITS THAT ARE CHECKED. FAILURE TO DO THIS WILL CAUSE UNSATISFACTORY RESISTANCE INDICATIONS AND POSSIBLE DAMAGE TO THE CIRCUITS.

(1) Disconnect the two connectors of the wire harness which contains the cable of the circuit to be checked.

(2) Shorted wire check.

(a) Do the shorted wire check on the suspect wire. Use a Model 1863 Megohmmeter or equivalent

(b) Set the megohmmeter to the 100 volt DC scale

1 Check the resistance between each pair of wires which are suspect.

2 The resistance must be infinity.

3 Defective circuits must be repaired (Ref. 20-71-00, Aircraft Wiring Manual).

(3) Insulation resistance check

R NOTE : Refer to the related Component Maintenance Manual to test
R the external braided cables.

(a) Do the insulation resistance check on the suspect circuit. Use a Model 1863 Megohmmeter or equivalent

(b) Set the Megohmmeter to the 500 volt DC scale.

1 Connect one test lead of the megohmmeter to the backshell body of the connector. Connect the other test lead to the contact (pin or socket) of the connector.

2 Measure the insulation resistance.

3 The resistance must be a minimum of 20 megohms.

4 Defective circuits must be repaired (Ref. 20-71-00, Aircraft Wiring Manual).

(4) Connect all the connectors and secure.

E. Close-Up
(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the warning notices.
(3)Reactivate the appropriate electrical systems.

ELECTRICAL HARNESS - APPROVED REPAIRS

1. General

A. All repaired terminal lugs must be replaced in 60 flight hours or less. The following repair procedure is considered temporary, due to its non-welded, crimp-type construction. The repair is intended as a means of providing the operator with fly-back capability to a repair facility capable of effecting a permanent repair of the harness.

B. The replacement terminal is a non-weld, crimp type.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Warning Notice
B.	Ohmmeter Model 260 or equivalent
C.	Crimping Tool
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

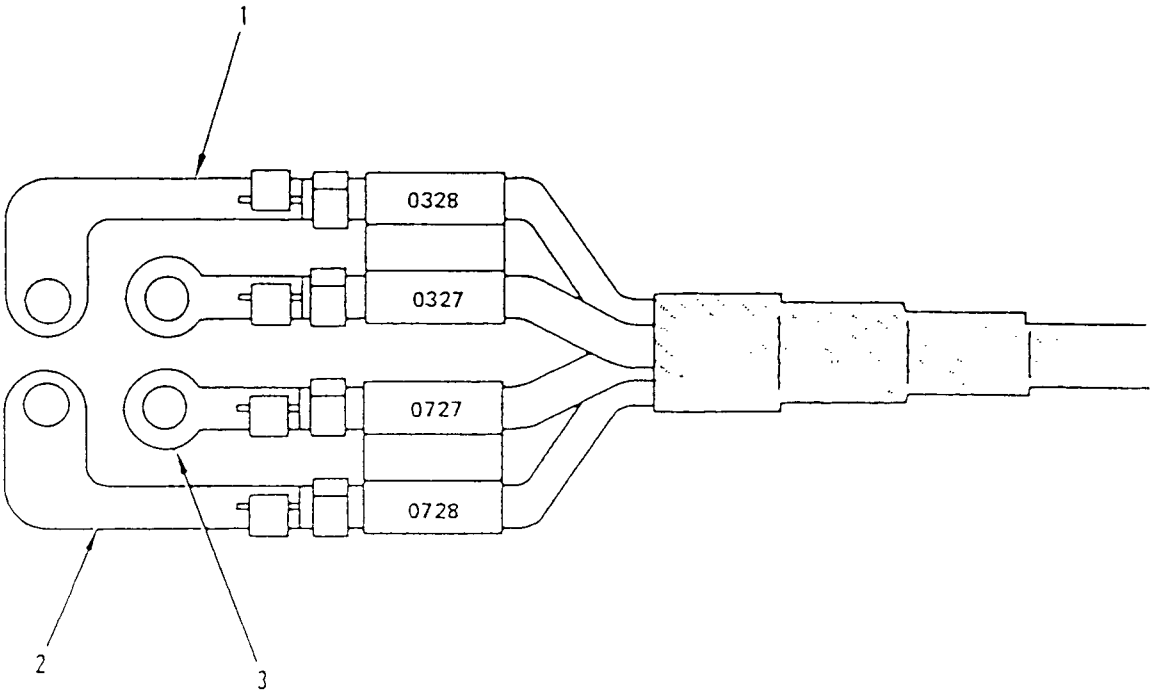
3. Procedures

A. Job Set-Up
(1)On the starting panel
Put a warning notice to tell persons not to start the engine 1(2).
(2)Make sure that the engine 1(2) has been shut down for at least 5 minutes.
(3)On the appropriate panel make sure that all electrical power is shut off to the engine 1(2). Install a warning notice.
(4)Open the fan cowl doors (Ref. 71-13-00, P. Block 301).

B. Terminal Lug Repair (Ref. Fig. 801, 802, 803)
(1)Break out damaged harness terminal lug.
(2)Open the grip portion of the termination band sufficiently to permit axial movement in the wire. Remove the fiberglass sleeve until the weld piece comes into view.
(3)Pry open the crimp pieces of the damaged terminal lug.
(a)One crimped piece on the conductor.
(b)One crimped piece on the wire insulation.
(4)Carefully file off the weld between the terminal and the wire sufficiently to permit the terminal to the removed.
(5)Select the appropriate terminal lug for replacement.
(a)Slide the terminal lug in place on the wire.
(b)Maintain a minimum of 0.030 in. (0.762 mm) between the crimp barrel and the wire insulation.
(c)If necessary, trim the wire insulation sufficiently to maintain the dimension.
(d)Crimp the terminal lug in place on the conductor.
1 Crimp one crimp piece over the conductor.
2 Crimp one crimp piece over the wire insulation.

(6)Move the fiberglass sleeve over the terminal lug crimp pieces until the crimp is not shown.
(7)Crimp the grip piece of the terminal band over the wire.
(8)With ohmmeter do a continuity test on the repaired circuit from the terminal lug to the connector contact.
(a)Each circuit must have continuity from one end of the wire to the other end of the wire.
NOTE : A permanent repair on the termination assembly must be made at a repair facility. The terminal branch wire must have sufficient lengths to maintain the tolerances. You can remove the crimped lug and install a new permanent lug. All four thermocouple terminals in the branch must be replaced to maintain the same length in the branch. You must move the termination band as necessary to maintain the dimensions. If the terminal branch wire length is not sufficient, the harness or the termination assembly must be replaced.

C. Close-Up
(1)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the warning notices.
(3)Reactivate the appropriate electrical systems.

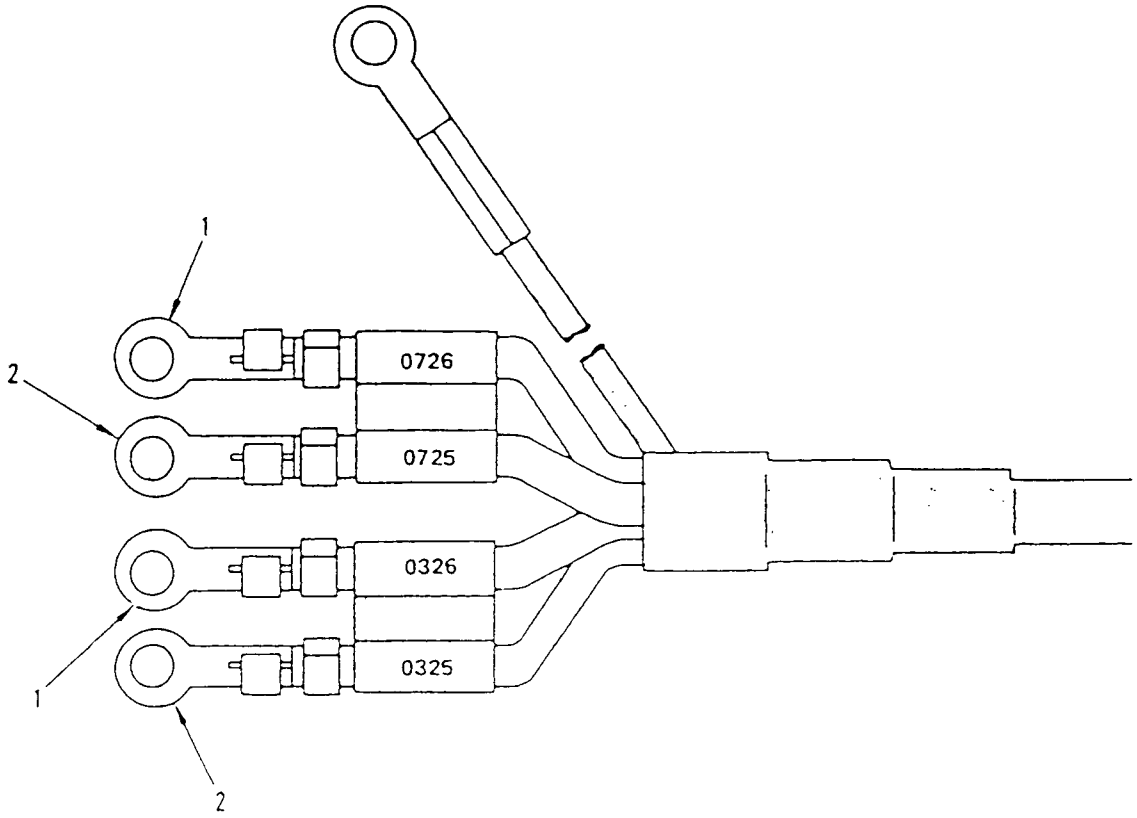


L-A6306 (0292)

1 - ALUMEL TERMINAL (PN 156485)
2 - ALUMEL TERMINAL (PN 156484)
3 - CHROMEL TERMINAL (PN 156487) (2 REQUIRED)

BM5 71 50 00 8 KAMO - 01

Terminal Lug Repair - FADEC Wiring Harness - W6 - T3
Figure 801

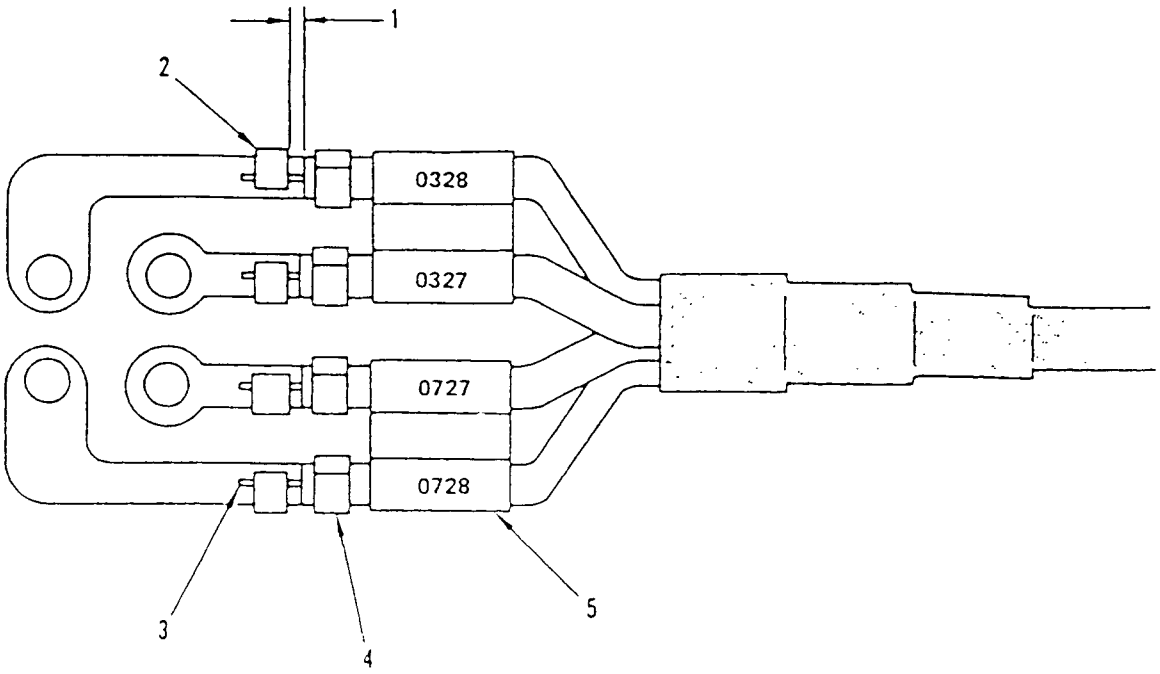


L-A6307 (0292)

1 - ALUMEL TERMINAL (PN 156486) 2 REQUIRED
2 - CHROMEL TERMINAL (PN 156487) 2 REQUIRED

BM5 71 50 00 8 KCMO - 01

Terminal Lug Repair - FADEC Wiring Harness - W6 - T4.95
Figure 802



L-A6308 (0292)

1 - 0.030 IN. (0.762 MM) 4 PLACES
2 - CRIMP PORTION
3 - FILE OFF WELD
4 - CLINCH PORTION
5 - TERMINATION BAND

BM5 71 50 00 8 KEMO - 01

Terminal Lug Repair - FADEC Wiring Harness - W6
Figure 803

ENGINE FAN CASE ELECTRICAL HARNESS - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Corrosion Resistant Steel Lockwire (MS20995C32) (Ref. 70-00-00)
D.	Torque Wrench
E.	Protective Covers
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

**ON A/C 101-200,

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A. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG1 AND 2 VIB	1EV	334/S71
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75
22VU	AUDIO SYS/INTPH AMPL-SVCE	20RJ	205/E17
For engine 1			
132VU	ANTI ICE/PROBES CAPT ENG1	85DA	325/K67
132VU	ANTI ICE/ENG ANTI ICE/VALVE CTL ENG1	1DN	321/P65
132VU	ANTI ICE/ENG ANTI ICE/WARN ENG1	3DN	322/N70
133VU	ENGINES/ENG1 REVERSE CTL	1KM	332/U69
133VU	ENGINES/ENG1 REVERSE WARN	3KM	332/U68
133VU	ENGINES/ENG1/THRUST REVERSER LOCK	45KM	332/U67
22VU	ENG FIRE DET/ENG1 LOOP A	1WD	209/A19
22VU	ENG FIRE DET/ENG1 LOOP B	3WD	209/A20
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
133VU	ENG1/SCU SUPPLY GND	35KS	333/T76
133VU	ENG1/SCU SUPPLY FLT	37KS	333/T75
For engine 2			
132VU	ANTI ICE/PROBES F/O ENG2	86DA	323/M70
132VU	ANTI ICE/ENG ANTI ICE/VALVE CTL ENG2	2DN	321/P66
132VU	ANTI ICE/ENG ANTI ICE/WARN ENG2	28DN	322/N71
133VU	ENGINES/ENG2 REV CTL	2KM	331/V74
133VU	ENGINES/ENG2 REV WARN	4KM	331/V73

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG2/THRUST REVERSER LOCK	44KM	331/V75
22VU	ENG FIRE DET/ENG2 LOOP A	2WD	209/A24
22VU	ENG FIRE DET/ENG2 LOOP B	4WD	209/A23
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69
133VU	ENG2/SCU SUPPLY GND	34KS	333/T85
133VU	ENG2/SCU SUPPLY FLT	36KS	333/T84

(2)Install access platform.
(3)Open fan cowl doors (Ref. 71-13-00, P. Block 301).

**ON A/C 101-200,

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B. Removal
(1)Remove wire harnesses 21W4118 and 21W4120 (Ref. Fig. 401) (Sheet 1).
(a)Disconnect electrical connectors D4998P, D4999P from pylon interface ; D5020P, D5021P and D5022P from left thrust reverser J-box, and D5000P and D5001P from engine electronic control (EEC). Install protective covers on exposed connectors.
(b)Remove attaching hardware and clamps (1) and (2) attaching wire harnesses to brackets and left thrust reverser J-box.
(c)Remove attaching hardware and clamps (3) and (4) that attach wire harnesses to support bracket on Flange A1.
(d)Remove attaching hardware and clamps (4) attaching wire harnesses to support bracket on Flanges B1 and B2.
(e)Remove wire harnesses 21W4118 and 21W4120 from fan case.
(2)Remove harnesses 21W4075, 21W4076, 21W4132 and 21W4150 (Ref. Fig. 401, 402).
(a)Disconnect electrical connector D5002P from left thrust reverser J-box and electrical connectors D4986J and D5018J from bracket (5). Install protective covers on exposed connectors (Ref. Fig. 401) (Sheet 1).
(b)Remove wire harnesses, attaching hardware and clamps from brackets (25) and (26).
(c)Remove attaching hardware and clamps attaching wire harnesses to brackets (6), (7) and (8) (Ref. Fig. 401) (Sheet 2).
(d)Arrange previously removed wire harness branches near the fan case center line so they can be pulled across the fan case from the right side of the thrust reverser.
(e)Disconnect electrical connectors D5006P, D5010P, D5051P and D5007P from right thrust reverser J-box ; D5019J, D4987J and D5008J from bracket (9) and D4989P, D4953P and D4966P from pylon interface. Install protective covers on exposed connectors (Ref. Fig. 402).
(f)Remove attaching hardware and clamps attaching harnesses to fan case.

(g)Remove wire harnesses 21W4076, 21W4132 and 21W4150 from fan case.

(3)Remove wire harnesses 21W4068, 21W4116 and 21W4140.
(Ref. Fig. 402, 404)

(a)Disconnect electrical connectors D4970P, D4963P and D4967P from pylon interface; D4965P from inlet cowl, DT588 from vibration accelerometer, and D5011P and D5053P from right thrust reverser J-box. Install protective covers.

(b)Remove harnesses, attaching hardware, and clamps from brackets (10 through 20).

(c)Remove wire harness 21W4068, 21W4116 and 21W4140 from fan case upper-right quarter.

(d)Disconnect electrical connectors D5054P and D5055P. Install protective covers.(Ref. Fig. 406)

(e)Remove wire harness 21W4068 from fan case upper-right and upper-left quarters.

(f)Disconnect electrical connector DV220 from anti-ice shutoff and regulating valve, DS300 from anti-ice pressure switch and D4969P from inlet cowl.
Install protective covers. (Ref. Fig. 404)

(g)Disconnect grounding wire from stud. Retain attaching hardware for re-installation.

(h)Remove harnesses, attaching hardware and clamps from brackets (21 through 31).

(i)Remove wire harnesses 21W4068, 21W4116 and 21W4140 from fan case lower-right quarter.

(j)Disconnect electrical connector DH15 from thrust reverser selector valve, DS304 from pneumatic drive unit (PDU) and DH9 from thrust reverser regulating and shutoff valve. Install protective covers. (Ref. Fig. 405)

(k)Remove harnesses attaching hardware and clamps from brackets (31, 32, 33).

(l)Remove wire harnesses 21W4068, 21W4116 and 21W4140 from fan case.

**ON A/C 101-200,

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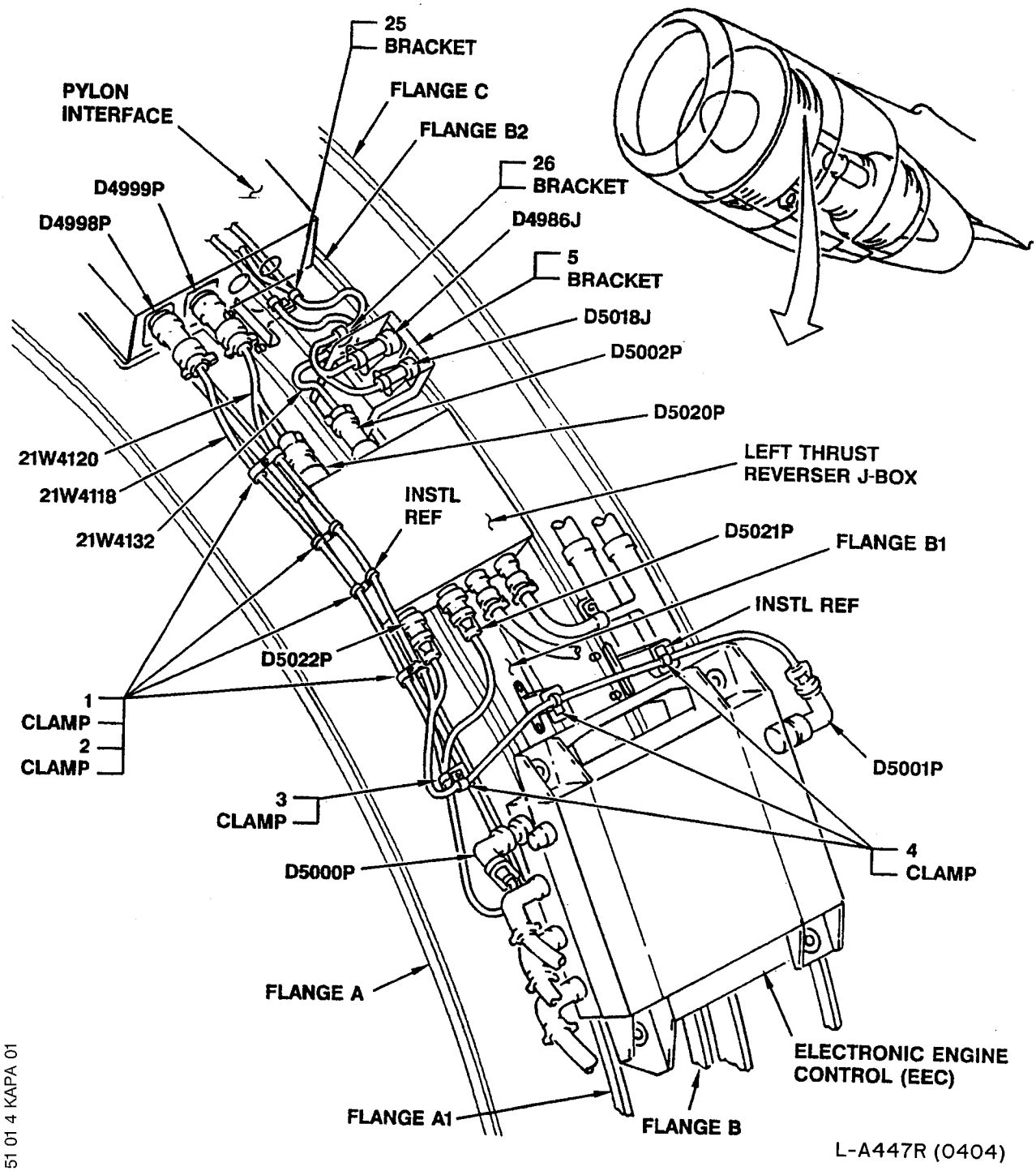
C. Installation

(1)Install wire harnesses 21W4068, 21W4116 and 21W4140.
(Ref. Fig. 405)

(a)Remove protective covers and connect electrical connectors DH15 to thrust reverser selector valve, DS304 to PDU and DH9 to thrust reverser regulating and shutoff valve. Tighten connectors fingertight plus one-eighth turn. Lockwire connectors.

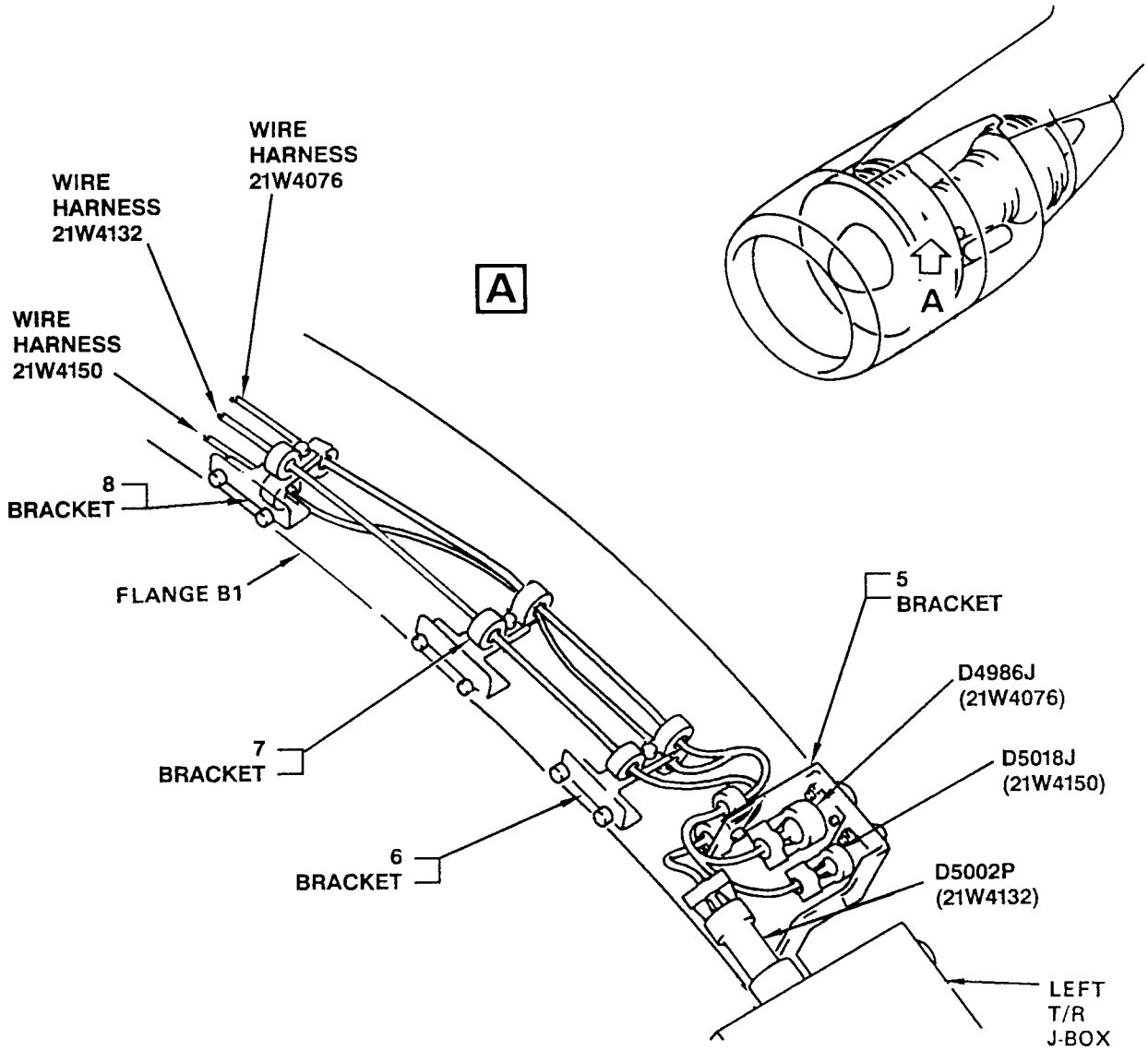
(b)Install harnesses, clamps and attaching hardware on brackets (31, 32, 33). TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(c)Remove protective covers and connect electrical connectors DV220 to anti-ice shutoff and regulating valve, DS300 to anti-ice pressure switch and D4969P to inlet cowl. Tighten connectors fingertight plus



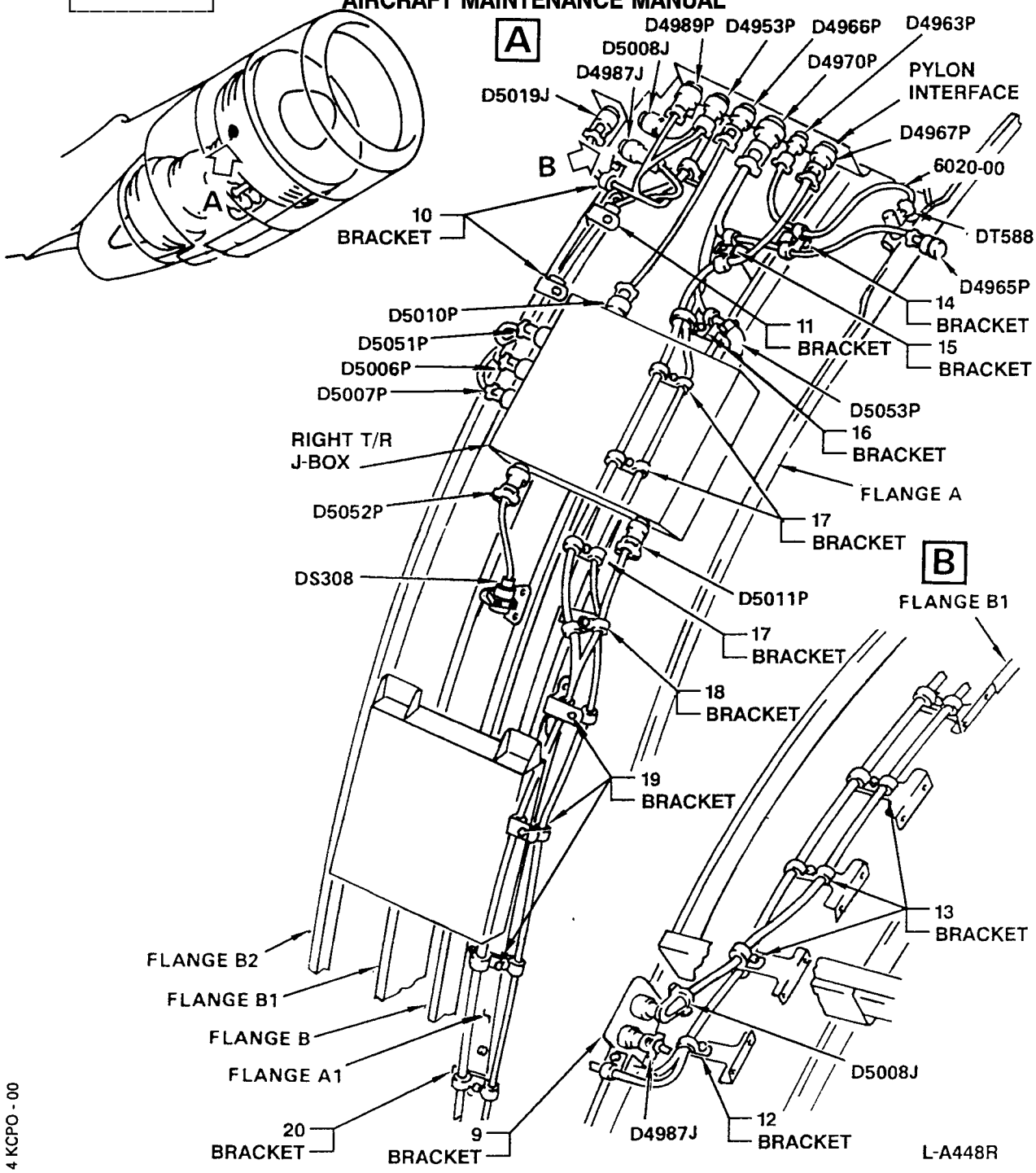
BM5 71 51 01 4 KAPA 01

Fan Case Electrical Harness, Upper Left (Sheet 1/2)
Figure 401



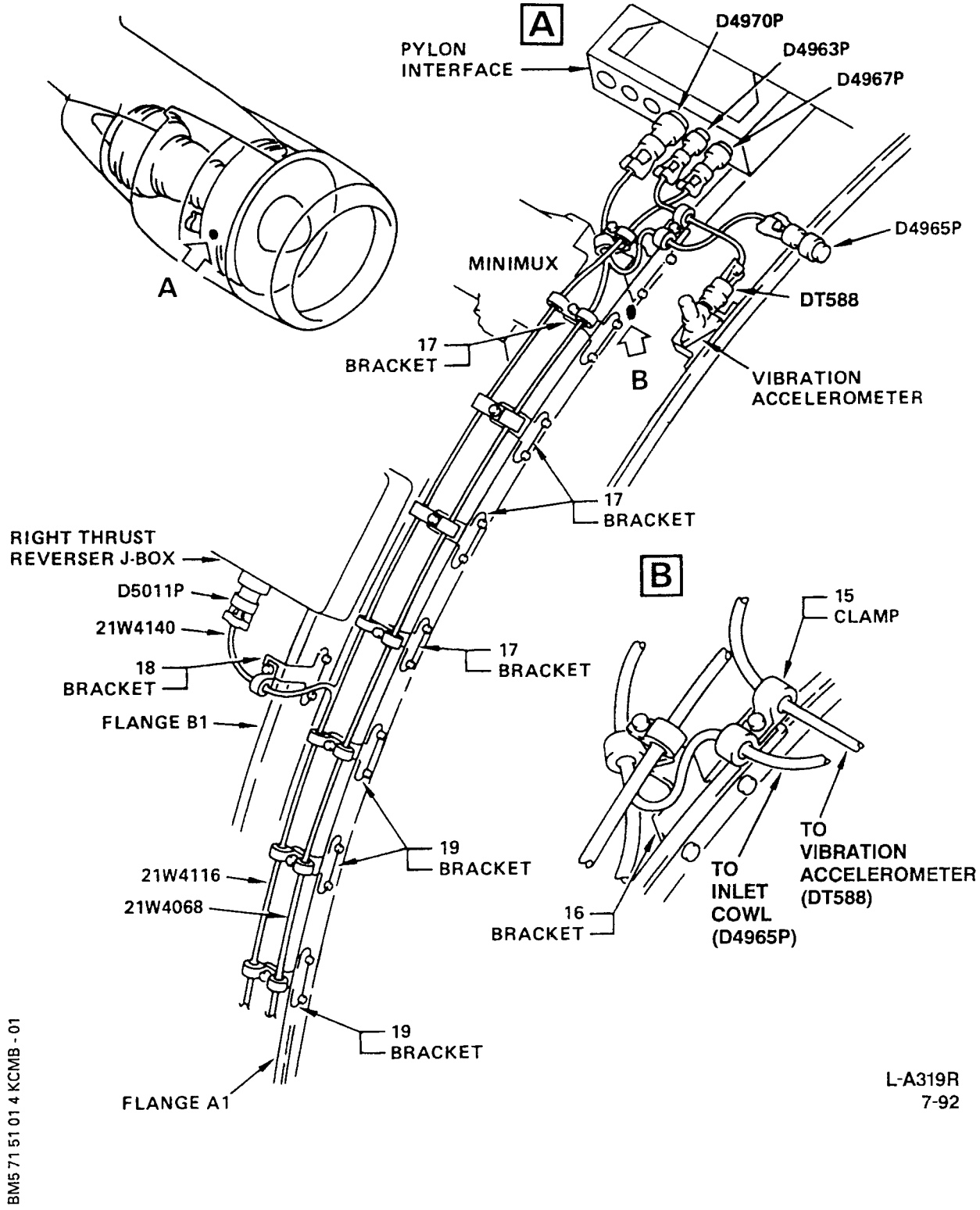
BM5 71 51 01 4 KAPB - 00

Fan Case Electrical Harness, Upper Left (Sheet 2/2)
Figure 401

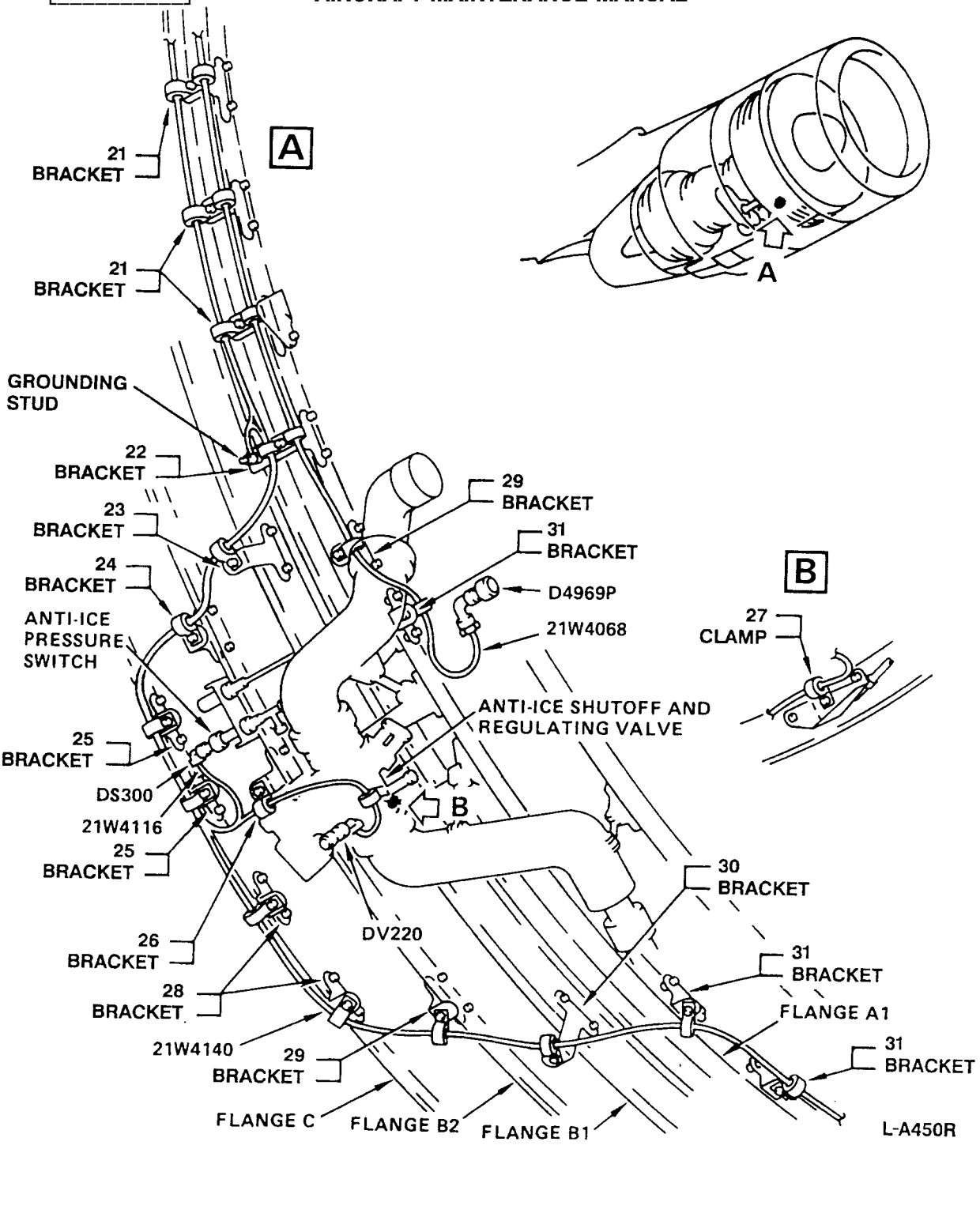


BM5 71 51 01 4 KCPO - 00

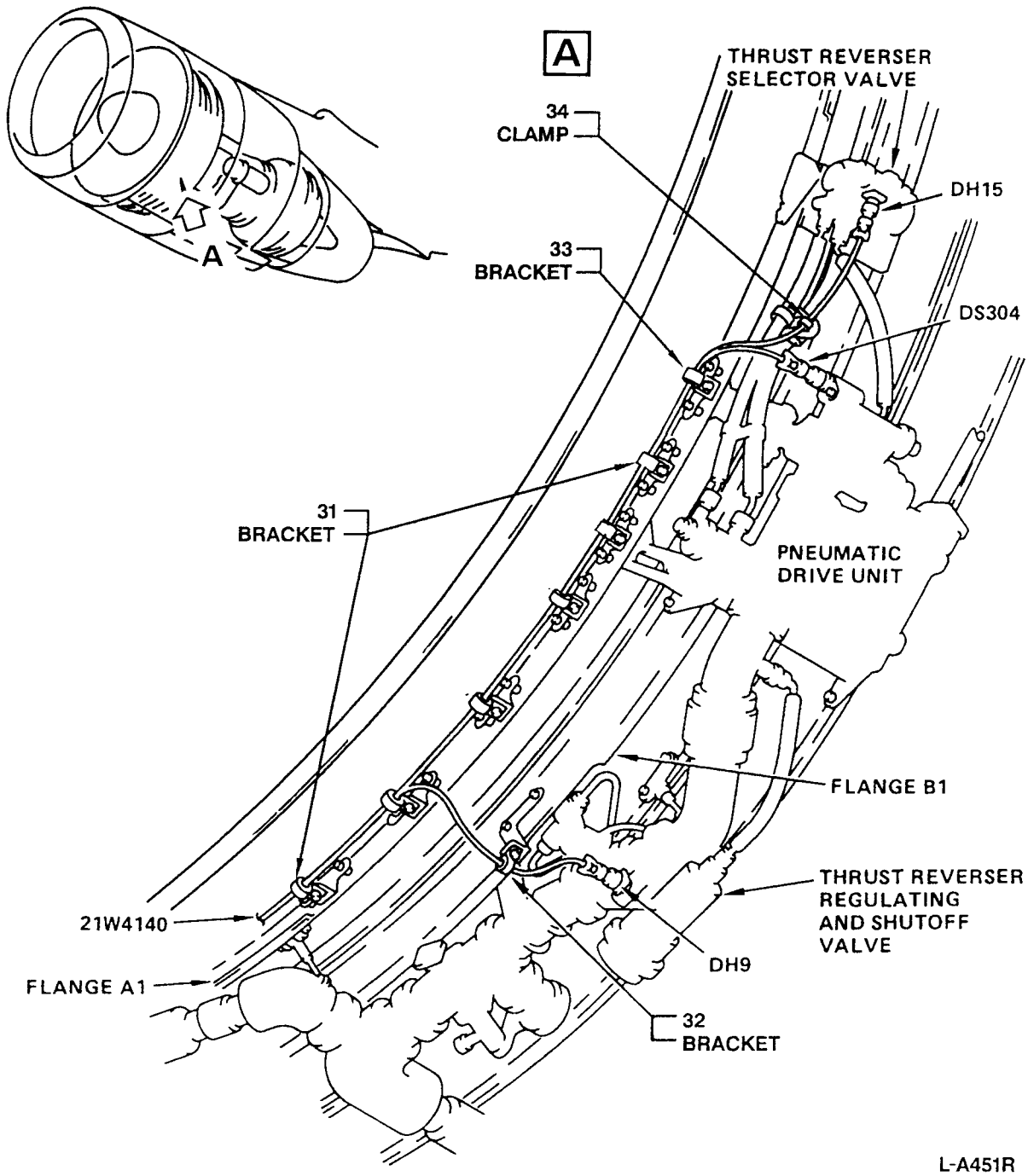
Fan Case Electrical Harness, Upper Right
Figure 402



Fan Case Electrical Harness, Upper-Right (Sheet 2/2)
Figure 403

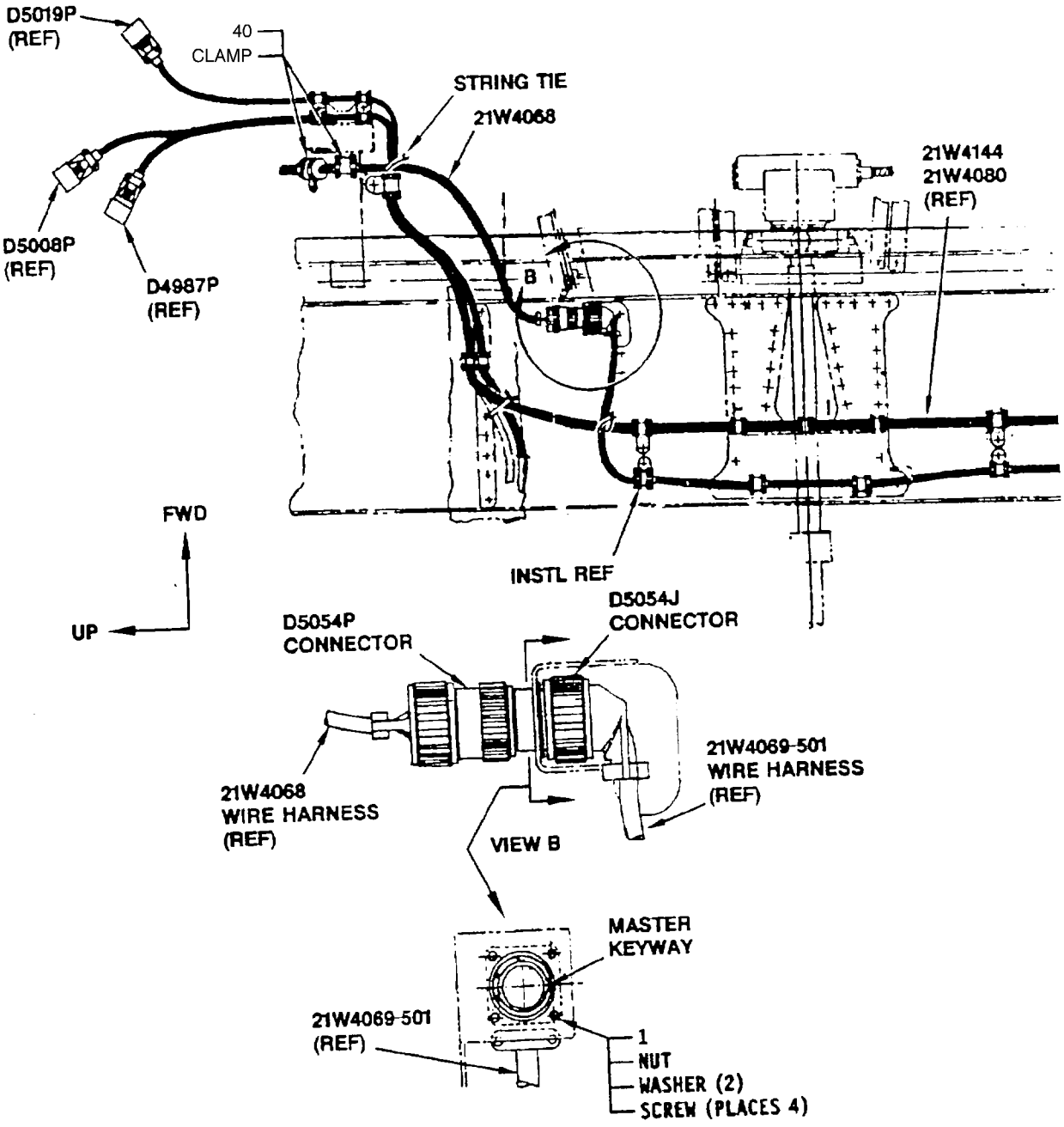


Fan Case Electrical Harness, Lower Right
Figure 404



BM57151014 KGPO-00

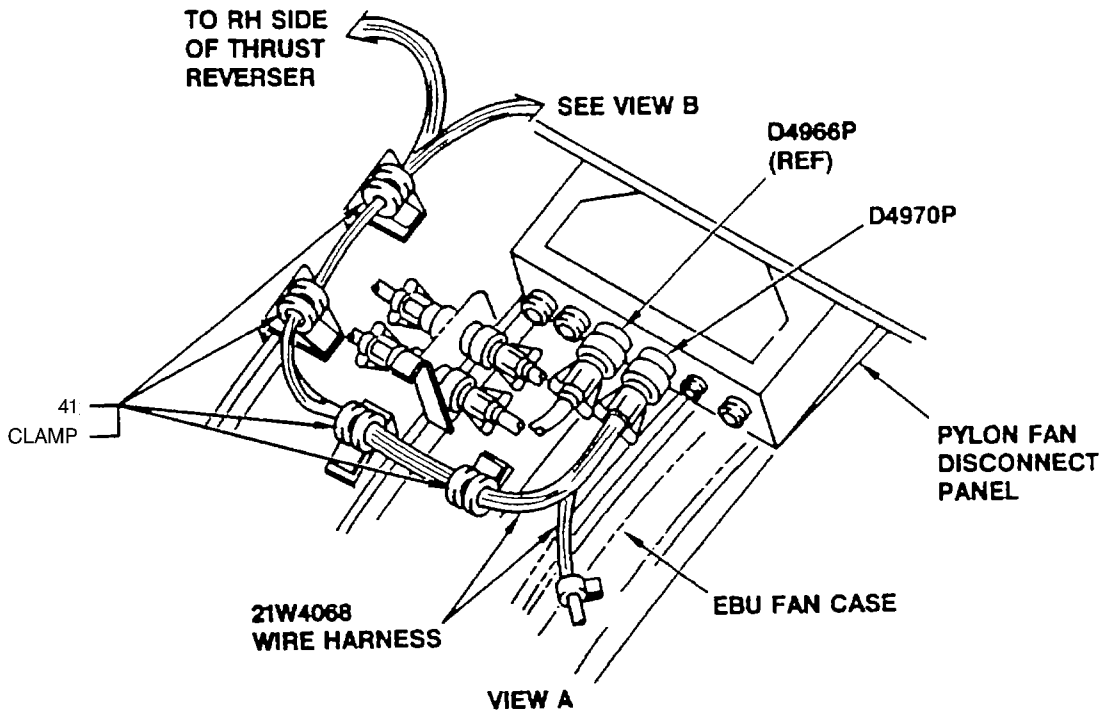
Fan Case Electrical Harness, Lower Left
Figure 405

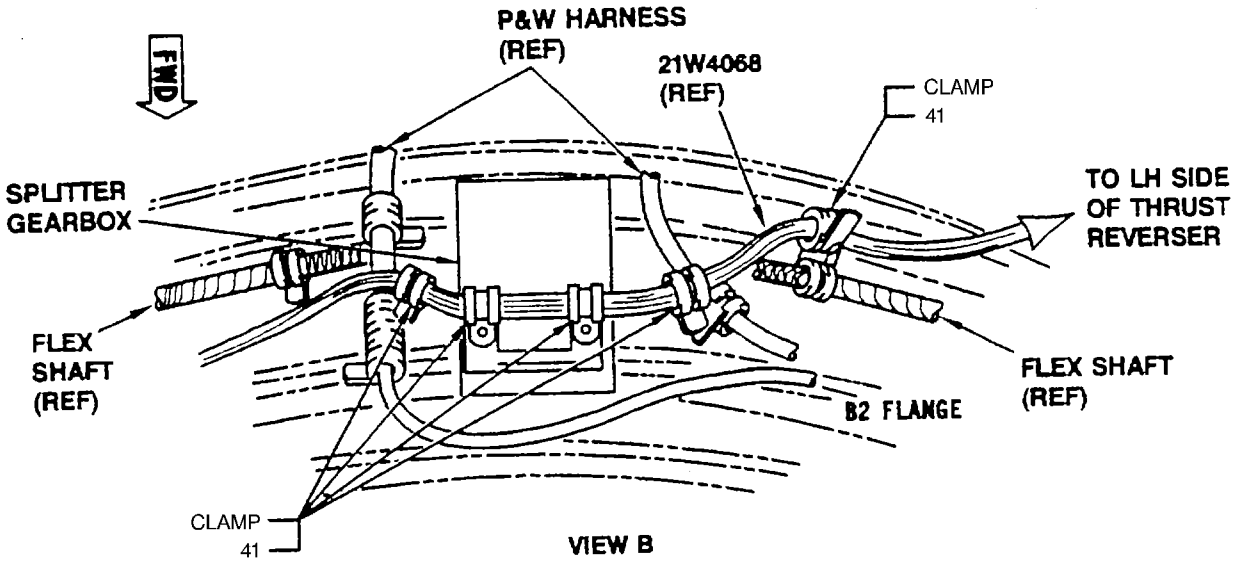


L-A096T (0401)

BM5 71 51 01 4 KJMA 01

Fan Case - Harness 21W4068 (Sheet 1/3)
Figure 406

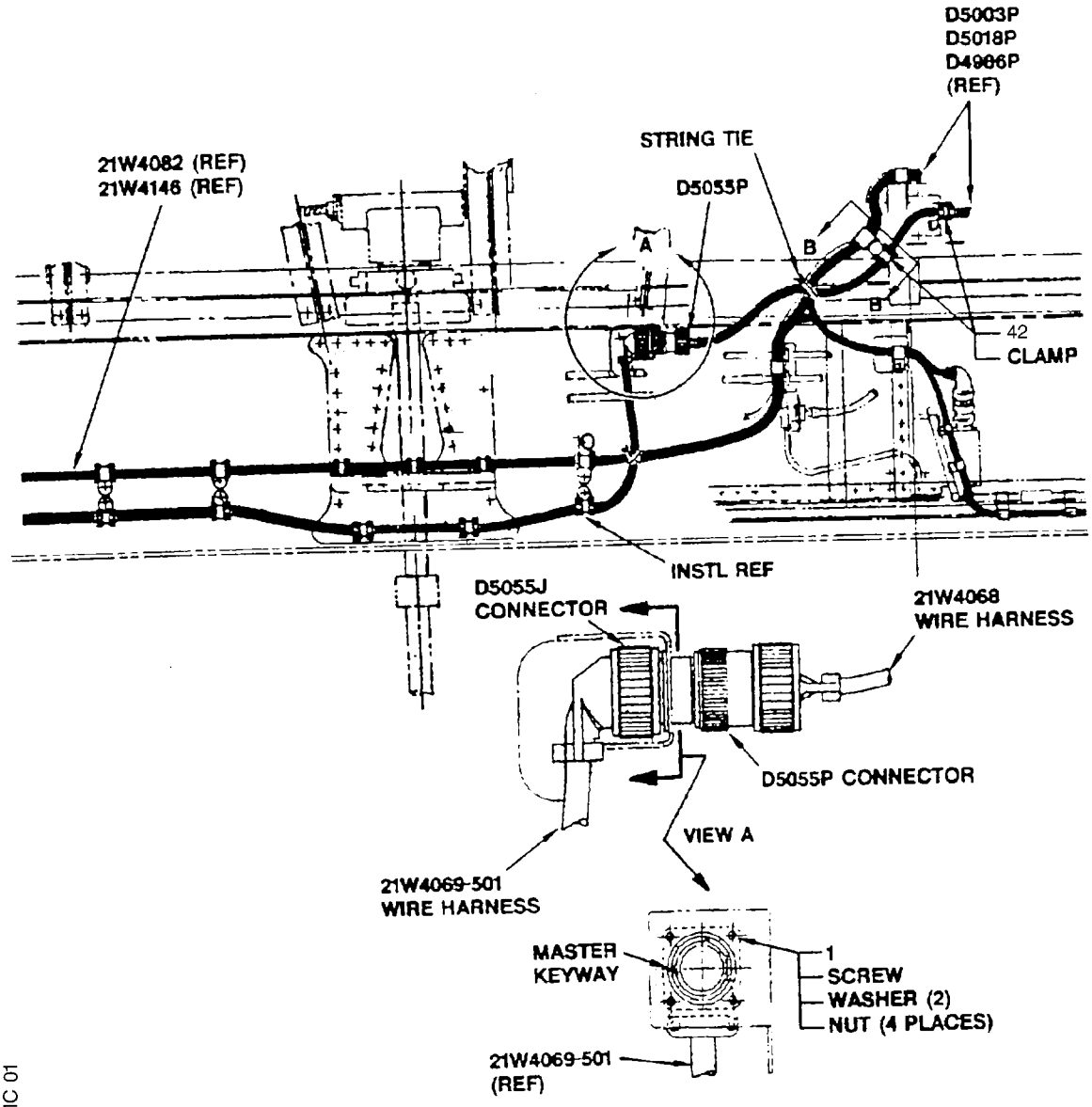




L-A097T (0401)

BM5 71 51 01 4 KJMB 01

Fan Case - Harness 21W4068 (Sheet 2/3)
Figure 406



BM5 71 51 01 4 KJMC 01

L-A098T (0401)

Fan Case - Harness 21W4068 (Sheet 3/3)
Figure 406

one-eighth turn. Lockwire connectors. (Ref. Fig. 404)

(d)Install grounding wire to stud using attaching hardware. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(e)Install harnesses, clamps and attaching hardware to brackets (21 through 31). TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(f)Remove protective covers and connect electrical connectors D5054P and D5055P. Tighten connectors fingertight plus one-eighth turn. (Ref. Fig. 406)

(g)Install harness 21W4068 on upper-right and upper-left fan cases with clamps (40), (41) and (42). Attach harness with string tie. (Ref. Fig. 406)

(h)TORQUE nuts to between 32 and 36 lbf.in. (0.36 - 0.40 m.daN).

(i)Remove protective covers and connect electrical connectors D4970P, D4963P and D4967P to pylon interface, D4965P to inlet cowl, DT588 to vibration accelerometer and D5011P and D5053P to right thrust reverser J-box. Tighten connectors fingertight plus one-eighth turn. Lockwire connectors. (Ref. Fig. 402)

(j)Install harnesses, clamps and attaching hardware to brackets (14 through 20). TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(2)Install wire harnesses 21W4075, 21W4076, 21W4132 and 21W4150. (Ref. Fig. 402)

(a)Position wire harnesses 21W4075, 21W4076, 21W4132 and 21W4150 on top of fan case and drape over to upper left side.

(b)Remove protective covers and connect electrical connectors D4989P, D4953P and D4966P to pylon interface; D5019J, D5008J and D4987J to bracket (9); and D5006P, D5007P, D5051P and D5010P to right thrust reverser J-box. Tighten connectors fingertight plus one-eighth turn. Lockwire connectors.

(c)Install harnesses, clamps and attaching hardware to brackets (10 through 13) to fan case. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(d)Straighten and lay out wire harnesses that were passed across the top of the fan case from upper right side. (Ref. Fig. 401)

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (Ref. 70-00-00, P. Block 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(e)Remove protective covers and connect electrical connectors D5002P to left thrust reverser J-box. (Ref. 70-00-00, P. Block 201).

(f)Remove protective covers and connect electrical connectors D4986J and D5018J to bracket (5).
Tighten connectors fingertight plus one-eighth turn. Lockwire connectors.

(g)Install harnesses, clamps and attaching hardware to brackets (6, 7, 8). TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(3)Install wire harnesses 21W4118 and 21W4120. (Ref. Fig. 401).

(a)Remove protective covers and connect electrical connectors D4998P and

D4999P to pylon interface.
Tighten connectors fingertight plus one-eighth turn. Lockwire connectors.
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (Ref. 70-00-00, P. Block 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(b) Remove protective covers and connect electrical connectors D5020P, D5021P and D5022P to left thrust reverser J-box ; and D5001P and D5000P to EEC (Ref. 70-00-00, P. Block 201).

(c) Use the INSTL REFs on wire harnesses to install wire harness, clamps (1), (2) and (3) and attaching hardware to the left thrust reverser J-box and bracket on Flange B2 respectively. TORQUE the clamp attaching hardware to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(d) Install wire harnesses, clamps (1) and (2) and attaching hardware to brackets and the left thrust reverser J-box. TORQUE the clamp attaching hardware to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(e) Install wire harnesses, clamps (3) and (4) and attaching hardware to support brackets on Flanges (A1 and B1). TORQUE the clamp attaching hardware to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(4) Install wire harness 21W4083. (Ref. Fig. 402)

(a) Remove protective covers. Connect electrical connector D5052P to J-box and electrical connector DS308 to barometric switch. Tighten connectors fingertight plus one-eighth turn. Lockwire connectors.

**ON A/C 101-200,

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D. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close fan cowl doors (Ref. 71-13-00, P. Block 301).

(3) Remove safety clips and tags and close circuit breakers : 1EV, 3KU, 20RJ, 85DA, 1DN, 3DN, 1KM, 3KM, 45KM, 1WD, 3WD, 19KS, 21KS, 35KS, 37KS, 86DA, 2DN, 28DN, 2KM, 4KM, 44KM, 2WD, 4WD, 18KS, 20KS, 34KS, 36KS.

(4) Remove access platform.

(5) Perform engine test No. 6 (Ref. 71-00-00, P. Block 501).

THRUST REVERSER JUNCTION BOX - REMOVAL/INSTALLATION

1. Removal/Installation of THRUST REVERSER J-BOX

A. Equipment and Materials

ITEM	DESIGNATION
A.	Protective Covers
B.	Access Platform
C.	Safety Clips
D.	Lockwire, MS20995N20
E.	Pliers, Soft-Jawed (Optional) (Glenair TG-69)
F.	Wrench, Strap (Glenair TG-70)
G.	Torque Wrench 100 lbf.in. (1.13 m.daN)
H.	Torque Wrench 50 lbf.in. (0.565 m.daN)
Referenced Procedure	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75
For engine 1			
133VU	ENGINES/ENG1 REVERSE CTL	1KM	332/U69
133VU	ENGINES/ENG1 REVERSE WARN	3KM	332/U68
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL A	19KS	332/U70
133VU	ENGINES/ENG1 FADEC SOLENOIDS CHANNEL B	21KS	331/V70
133VU	ENG1/SCU SUPPLY GND	35KS	333/T76
133VU	ENG1/SCU SUPPLY FLT	37KS	333/T75
For engine 2			
133VU	ENGINES/ENG2 REV CTL	2KM	331/V74
133VU	ENGINES/ENG2 REV WARN	4KM	331/V73
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL A	18KS	332/U71
133VU	ENGINES/ENG2 FADEC SOLENOIDS CHANNEL B	20KS	331/V69
133VU	ENG2/SCU SUPPLY GND	34KS	333/T85
133VU	ENG2/SCU SUPPLY FLT	36KS	333/T84

(2)Install access platform.

(3)Open fan cowl doors (Ref. 71-13-00, P. Block 301).

C. Removal of J-Box-Left Hand Side (Ref. Fig. 401)

(1)Remove lockwire and disconnect electrical connectors D5003P, D5021P, D5020P, D5002P, D5022P, and P & W connectors from the J-Box (5) located on the left side of fan case. Install protective covers on connectors.

(2)Remove screws (10), washers (15), and clamps (20) that attach wire harnesses to aft side of J-Box (5).

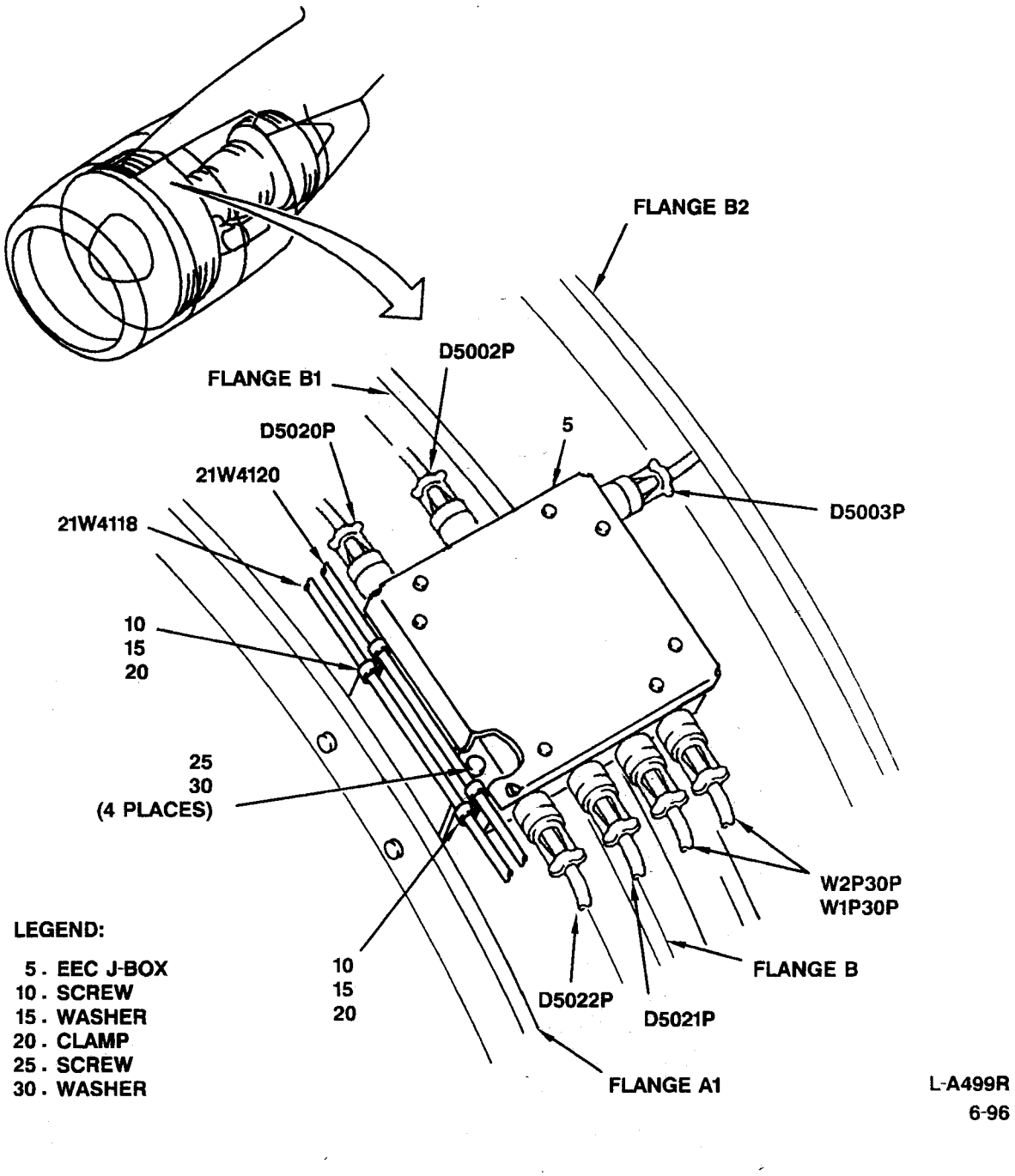
(3)Remove screws (25), washers (30) that attach J-Box (5) to brackets on

fan case.
(4)Remove J-Box (5).

D. Installation of J-Box-Left Hand Side (Ref. Fig. 401)
(1)Install J-Box (5) on brackets on left side of fan case with screws (10), and washers (15). TORQUE screws to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).
(2)Attach wire harnesses (21W4120 and 21W4118) to aft side of J-Box (5) with clamps (20), screws (10), and washers (15).TORQUE screws to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(3)Align electrical connectors D5003P, D5021P, D5020P, D5022P and D5002P of wire harness keyways with mating receptacles.
NOTE : Witness (color) band is the first band receptacle.
(4)Tighten connector D5021P, D5022P, D5002P, D5020P, and D5003P coupling nuts until witness (color) band on receptacle is out of view and coupling nuts are fingertight.
CAUTION : INCORRECT TOOLS CAN DAMAGE CONNECTORS. LOOSE CONNECTORS MAY ALLOW ENGINE VIBRATION TO CAUSE CONTACTS TO WEAR AND CREATE UNSATISFACTORY LIGHTNING PROTECTION.
(5)Tighten connector coupling nuts with strap wrench (Glenair TG-70) or soft-jawed pliers (Glenair TG-69).
Use sufficient force to ensure coupling nuts are fully tightened against receptacles (metal-to-metal contact).
NOTE : When tools are used correctly, contacts will be sufficiently engaged and connector coupling nuts will be tight. If excessive force is used, tools will turn on coupling nuts without tightening nuts, preventing nuts from being overtorqued.
(6)Connect W1P30P and W2P30P connectors.
(7)Wirelock connectors.

E. Removal of J-Box-Right Hand Side (Ref. Fig. 402)
(1)Remove lockwire and disconnect electrical connectors D5011P, D5052P, D5053P, D5007P, D5010P, D5006P, and D5051P from J-Box (5) on brackets on fan case.
Install protective covers on connectors.
(2)Remove screws (10), and washers (15) attaching J-Box to brackets on fan case.
(3)Remove J-Box (5).

F. Installation of J-Box-Right Hand Side (Ref. Fig. 402)
(1)Install J-Box (5) on brackets on right side of fan case with screws (10), and washers (15). TORQUE screws to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(2)Align electrical connectors D5011P, D5052P, D5053P, D5007P, D5010P, D5006P, and D5051P of wire harness keyways with mating receptacles.
NOTE : Witness (color) band is the first band receptacle.
(3)Tighten connector D5011P, D5052P, D5053P, D5007P, D5010P, D5006P, and D5051P coupling nuts until witness (color) band on receptacle is out of view and coupling nuts are fingertight.
CAUTION : INCORRECT TOOLS CAN DAMAGE CONNECTORS. LOOSE CONNECTORS MAY ALLOW ENGINE VIBRATION TO CAUSE CONTACTS TO WEAR AND CREATE



Thrust Reverser J-Box-Left Hand Side
Figure 401

UNSATISFACTORY LIGHTNING PROTECTION.

(4)Tighten connector coupling nuts with strap wrench (Glenair TG-70) or soft-jawed pliers (Glenair TG-69).
Use sufficient force to ensure coupling nuts are fully tightened against receptacles (metal-to-metal contact).
NOTE : When tools are used correctly, contacts will be sufficiently engaged and connector coupling nuts will be tight. If excessive force is used, tools will turn on coupling nuts without tightening nuts, preventing nuts from being overtorqued.
(5)Wirelock connectors.

G.Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers : 3KU, 1KM, 3KM, 19KS, 21KS, 35KS, 37KS, 2KM, 4KM, 18KS, 20KS, 34KS, 36KS.
(4)Remove access platform.
(5)Perform engine test no. 6 (Ref. 71-00-00, P. Block 501).

2. Removal/Installation of Thrust Junction Box K1 Relay

A. Equipment and Materials

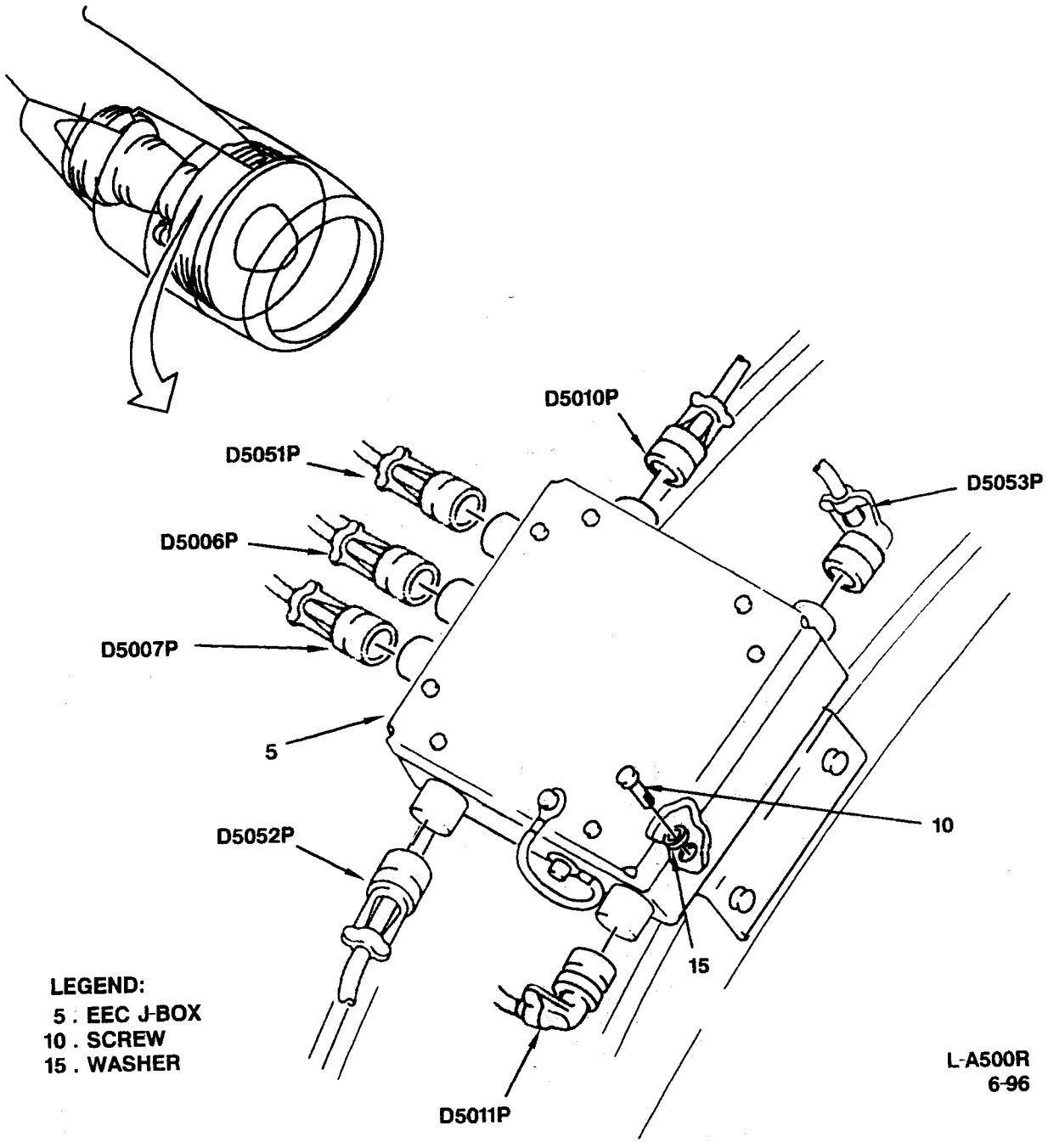
ITEM	DESIGNATION
A.	Safety Clips
B.	Access Platform
C.	Torque Wrench 30 lbf.in. (0.339 m.daN)
D.	Torque Wrench 55 lbf.in. (0.6215 m.daN)
Referenced Procedure	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	NACELLE COOLING ENG1 AND 2	3KU	336/Q75
For engine 1			
133VU	ENGINES-ENG1 REVERSE CTL	1KM	332/U69
133VU	ENGINES-ENG1 REVERSE WARN	3KM	332/U68
For engine 2			
133VU	ENGINES-ENG2 REV CTL	2KM	331/V74
133VU	ENGINES-ENG2 REV WARN	4KM	331/V73

(2)Install access platform.
(3)Open right hand fan cowl (Ref. 71-13-00, P. Block 301).

C. Removal of K1 Relay (Ref. Fig. 403)

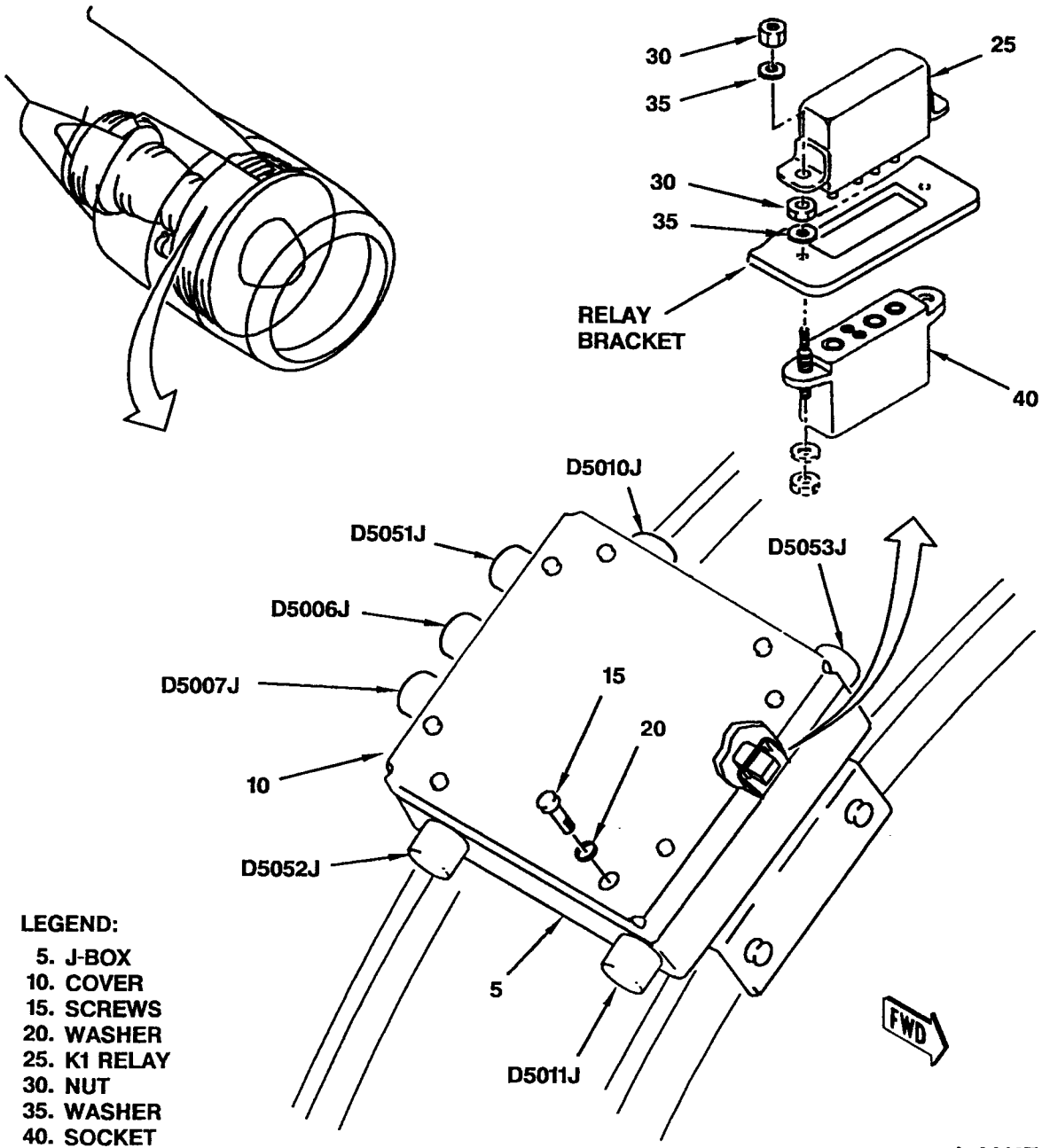


Thrust Reverser J-Box-Right Hand Side
Figure 402

(1)Remove eight screws (15) and washers (20), attaching the cover (10) to the J-Box (5). Remove J-Box cover.
(2)Locate the K1 relay (25). Remove nuts (30), and washers (35) and pull relay free from socket (40).

D. Installation of K1 Relay (Ref. Fig. 403)
(1)Install K1 relay (25) into socket (40) in J-Box (5).
Install nuts (30), and washers (35). TORQUE the nuts to between 2 and 3 lbf.in. (0.023 and 0.033 m.daN).
(2)Install cover (10) onto J-Box (5). Secure with screws (15), and washers (20) in eight locations.
TORQUE screws to between 22.5 and 25.0 lbf.in. (0.25 and 0.28 m.daN).

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close right hand fan cowl door (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers : 3KU, 1KM, 3KM, 2KM, 4KM.
(4)Remove access platform.
(5)Perform engine test no. 6 (Ref. 71-00-00, P. Block 501).



LEGEND:

5. J-BOX
10. COVER
15. SCREWS
20. WASHER
25. K1 RELAY
30. NUT
35. WASHER
40. SOCKET

BM5 71 51 02 4 KAP0 00

J-Box K1 Relay
Figure 403

ENGINE CORE ELECTRICAL HARNESS - REMOVAL/INSTALLATION

1. Removal/Installation of the Engine Core Harnesses (Pre SB PW4NAC 71-151)

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Corrosion Resistant Steel Lockwire (MS 20995C32) (Ref. 70-00-00)
D.	Torque Wrench
E.	Protective Covers
F. Material No. 08-004	Bonding and Adhesive Compounds (Ref. 20-31-00)
Referenced Procedures	
- 06-41-54, P. Block 1	Nacelles and Pylons (Power Plant Access Doors)
- 20-31-00, P. Block 1	List of Materials Required for Aircraft Service and Maintenance
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
21VU	ECAM/SDAC 26VAC REF2	3WV2	109/A02
21VU	ECAM/SDAC 26VAC REF3	5WV	109/A03
21VU	ECAM/SDAC SUPPLY	6WV	109/A05
133VU	ENGINES/ENG1 AND 2 START CTL AND WARN	1KG	335/R68
133VU	ENGINES/ENG1 AND 2 IGNITION SYST B	2JH	333/T72
For engine 1			
22VU	ELEC/DISC IDG1	3XT	206/D20
133VU	ELEC/GEN1 COOL VALVE	1XT	332/U80
131VU	AIR BLEED/ENG1 VALVES HP	3HA	311/H53
22VU	AIR BLEED/ENG1 WARN	9HA	203/G15
131VU	AIR BLEED/ENG1 VALVES BLEED	11HA	311/H54
133VU	HYDRAULIC/ENG1 PUMP CTL G	99GK	331/V58
133VU	HYDRAULIC/ENG1 PUMP CTL B	31GJ	331/V57
133VU	ENGINES/ENG1 OIL CLOG	1EF	331/V71
133VU	ENGINES/ENG1 FUEL FILTER	1EL	332/V72
133VU	ENGINES/OIL ENG1 QTY	1EN	336/Q68
133VU	ENGINES/OIL ENG1 LO PRESS	1ES	336/Q69
133VU	ENGINES/OIL ENG1 PRESS	13ES	336/Q70
133VU	ENGINES/ENG1 FUEL HP VALVE CTL	3KC	333/T69
For engine 2			
22VU	ELEC/DISC IDG2	4XT	206/D21
133VU	ELEC/GEN2 COOL VALVE	2XT	331/V80
131VU	AIR BLEED/ENG2 VALVES HP	4HA	312/G53
131VU	AIR BLEED/ENG2 WARN	10HA	312/G54
131VU	AIR BLEED/ENG2 VALVES BLEED	12HA	311/H55
133VU	HYDRAULIC/ENG2 PUMP CTL G	100GK	332/U58

PANEL	SERVICE	IDENT.	LOCATION
133VU	HYDRAULIC/ENG2 PUMP CTL Y	1GD	332/U57
133VU	ENGINES/ENG2 OIL CLOG	2EF	332/U73
133VU	ENGINES/ENG2 FUEL FILTER	2EL	332/U72
133VU	ENGINES/OIL ENG2 QTY	2EN	336/Q73
133VU	ENGINES/OIL ENG2 LO PRESS	2ES	336/Q72
133VU	ENGINES/OIL ENG2 PRESS	14ES	336/Q71
133VU	ENGINES/ENG2 FUEL HP VALVE CTL	4KC	333/T70

(2)Install access platform.
(3)Open fan cowl doors (Ref. 71-13-00, P. Block 301).

C. Removal (PRE SB PW4NAC 71-70)
(1)Remove wire harnesses 21W4114, 21W4070, and 21W4072 (Pre SB PW4NAC 71-107) (Ref. Fig. 401) (Sheet 1/2).
(a)Remove terminal cover and attaching hardware from IDG.
(b)Remove nuts and washers attaching wires to IDG terminal studs and remove wires from studs.
(c)Disconnect connectors DG13A and DG13B from IDG. Install protective covers.
(d)Remove attaching hardware and clamps attaching harness to harness support.
(e)Remove cable guide bracket from support bracket.
(f)Remove attaching hardware and clamps attaching harness to support bracket.
(g)Remove bolts, washers, and nuts attaching wires 070001-00N and 070002-00N to ground studs (Ref. Fig. 402).
(h)Disconnect electrical connector DV213 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.
(i)Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.
(j)Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).
(k)Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.
(l)Remove attaching hardware and clamps attaching harnesses to brackets (5), (6) and (7).
(m)Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.
(n)Remove attaching hardware and clamp (8) attaching harness to engine.
(o)Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.
(p)Remove attaching hardware, clamps (9), (11) and (12), and clamp shell (10) attaching harnesses to engine.
(q)Remove attaching hardware and clamp supports (13) attaching IDG harness to brackets (Ref. Fig. 403, 410).
(r)Disconnect electrical connector D4955 from pylon generator wire harness

receptacle. Remove IDG wire harness, 21W4114, from engine. Install protective covers (Ref. Fig. 404).

(s)Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers.

(t)Remove attaching harware, clamps (14), and clamp shells (15) attaching harness to tubing bracket.

(u)Remove nuts, washers and contacts 1387-3 and 1387-4 from high-stage temperature sensor terminals.

(v)Remove attaching hardware, clamps (16), and clamp shells (17) attaching hardware to tubing brackets.

(w)Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.

(x)Remove attaching hardware and clamp (20) attaching harness to engine bracket.

(y)Disconnect electrical plugs D4958 from pylon interface panel receptacles. Remove wire harnesses 21W4070 and 21W4072 from engine. Install protective covers.

(2)Remove wire harnesses 21W4114, 21W4070, and 21W4072 (Post SB PWNAC 71-107). (Ref. Fig. 401) (Sheet 2/2).

(a)Remove terminal cover and attaching hardware from IDG.

(b)Remove nuts and washers attaching wires to IDG terminals studs and remove wires from studs.

(c)Disconnect connectors DG13A and DG13B from IDG. Install protective covers.

(d)Remove attaching hardware and clamp attaching harness to IDG oil outlet tube assembly.

(e)Remove IDG terminal cover screw and clamp attaching harness to IDG terminal block cover.

(f)Remove cable guide bracket from support bracket.

(g)Remove attaching hardware and clamps attaching harness to support bracket.

(h)Remove bolts, washers, and nuts attaching wires 070001-00N and 070002-00N to ground studs (Ref. Fig. 402).

(i)Disconnect electrical connector DV213 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.

(j)Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.

(k)Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).

(l)Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.

(m)Remove attaching hardware and clamps attaching harnesses to brackets (5), (6) and (7).

(n)Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.

(o)Remove attaching hardware and clamp (8) attaching harness to engine.

(p)Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.

(q)Remove attaching hardware, clamps (9), (11) and (12), and clampshell

(10) attaching harnesses to engine.

(r) Remove attaching hardware and clamp supports (13) attaching IDG harness to brackets (Ref. Fig. 403, 410).

(s) Disconnect electrical connector D4955 from pylon generator wire harness receptacle. Remove IDG wire harness, 21W4114, from engine. Install protective covers (Ref. Fig. 404).

(t) Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers.

(u) Remove attaching hardware, clamp (14), and clampshell (15) attaching hardware to tubing bracket.

(v) Remove nuts, washers and contacts 1387-3 and 1387-4 from high-stage temperature sensor terminals.

(w) Remove attaching hardware, clamps (16), and clampshells (17) attaching hardware to tubing brackets.

(x) Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.

(y) Remove attaching hardware and clamp (20) attaching harness to engine bracket.

(z) Disconnect electrical plugs D4954 and D4958 from pylon interface panel receptacles. Remove wire harnesses 21W4070 and 21W4072 from engine. Install protective covers.

(3) Remove electrical harness 21W4972 (Ref. Fig. 405)

(a) Disconnect connector DT579 from No. 3 bearing oil temperature sensor and electrical connector DV215 from starter shutoff valve. Install protective covers.

(b) Remove attaching hardware and clamp (1) attaching harness to starter shutoff valve cover.

(c) Remove attaching hardware and clamps attaching harness to support brackets, drain filters support bracket, and bracket on Flange M.

(d) Disconnect connector DV214 from hydraulic pump. Install protective covers.

(e) Remove attaching hardware and clamps (2) and (3) attaching harness to support bracket and hydraulic pump.

(f) Remove attaching hardware and clamps (4) and (6) attaching harness to stator vane actuator support bracket ; and clamps (5) and (7) attaching harness to tube support brackets (Ref. Fig. 406).

(g) Disconnect electrical connector DV216 from IDG ADC valve. Install protective covers.

(h) Disconnect connector DT581 from fuel pressure transmitter and electrical connector DT595 from core compartment temperature sensor. Install protective covers (Ref. Fig. 407).

(i) Remove attaching hardware and clamps (9) and (10) attaching harness to fuel pressure transmitter support bracket and tube support bracket.

(j) Disconnect connector DH10 from fuel condition actuator. Install protective covers.

(k) Remove attaching hardware, clamps (11), (13) and (15), and clamp shell (14) attaching harness to tube support brackets and clamp (12) attaching harness to fuel condition actuator support bracket.

(l) Disconnect connector D4991 from fuel pump and connector DT580 from fuel pump and connector DT580 from fuel flow transmitter. Install protective covers.

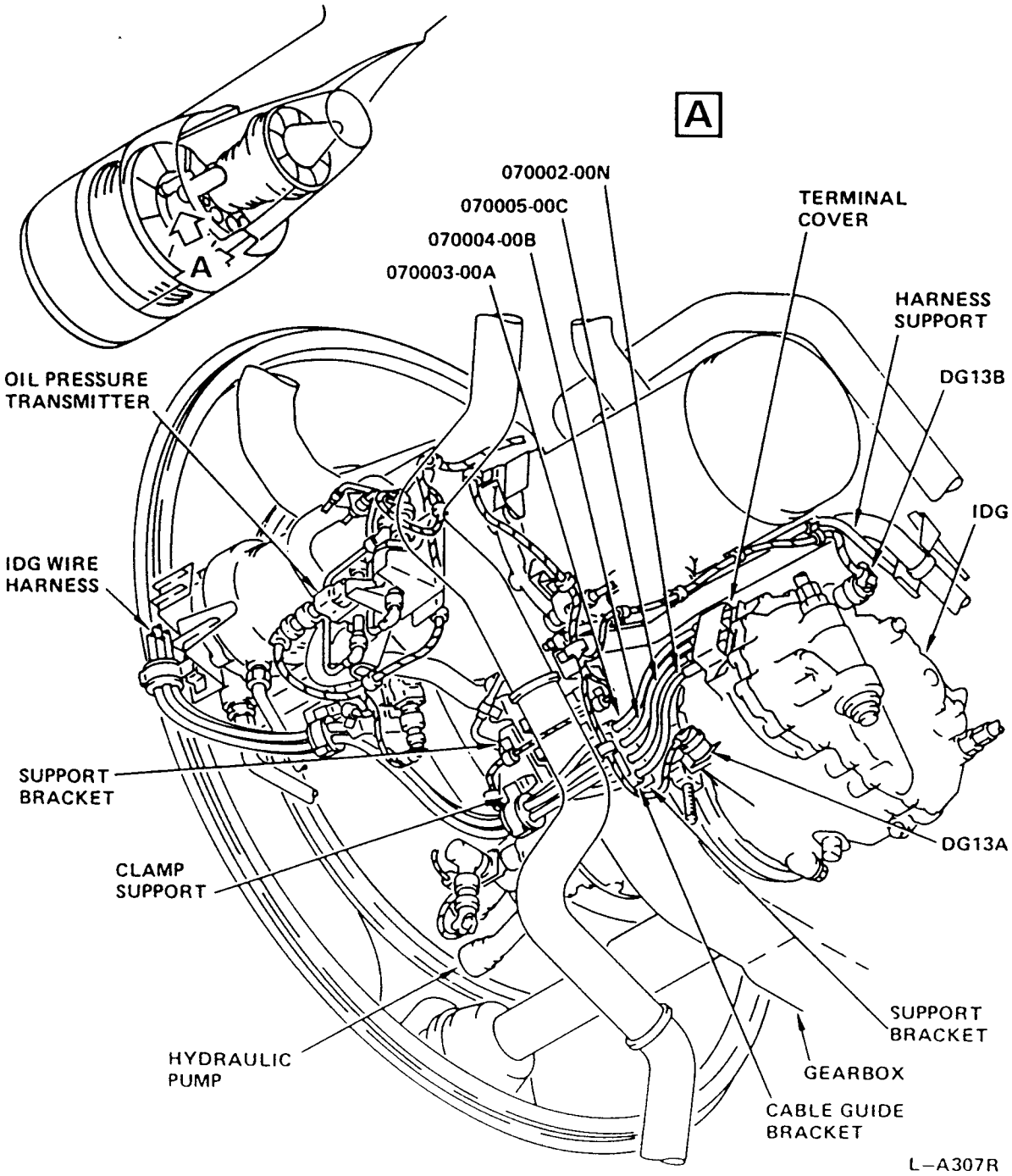
(m)Remove attaching hardware and clamps (16) and (17) attaching harness to fuel flow transmitter support bracket.
(n)Remove attaching hardware and clamp (18) attaching harness to drain filters support bracket and support bracket (Ref. Fig. 408).
(o)Disconnect electrical connector DH8 from ignitor exciter and electrical connector DH7 from engine exciter. Instal protective covers.
(p)Remove attaching hardware and clamps (19) and (20) attaching harness to brackets ; and clamps attaching harness to brackets (21), (22) and (23).
(q)Remove attaching hardware and clamps attaching electrical harness to support brackets (24), (25) and (27) (Ref. Fig. 409).
(r)Remove ground connection support bracket with ground connections attached.
(s)Remove attaching hardware, clamps (26), (27) and (28) and clamp shells (27) attaching harness to existing brackets.
(t)Disconnect electrical DS298 from IDG ADC pressure switch. Install protective covers.
(u)Disconnect electrical plugs D4952, D4956 and D4961 from pylon interface panel receptacles. Install protective covers.
(v)Remove wire harness 21W4972 from right side of engine core.

D. Installation (Pre SB PW4NAC 71-70)
(1)Install wire harness 21W4072 (Ref. Fig. 409).

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

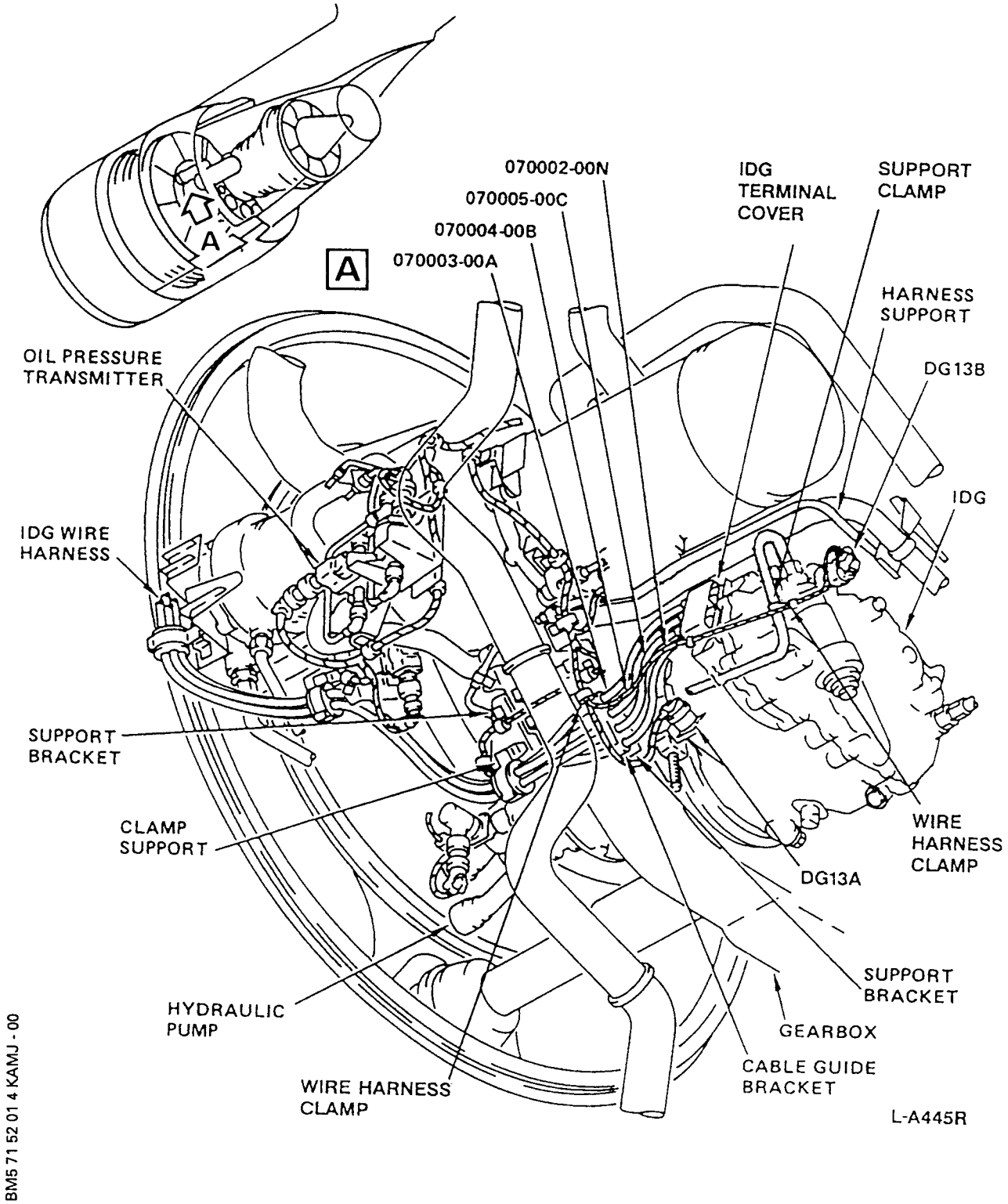
NOTE : Be sure you connect the proper connector to the proper receptacle. The D4952P connector/receptacle is rearward of the D4956P connector. Use the color codes on the connector and receptacle if equipped (Post SB PW4 NAC 71-87) (Ref. Fig. 409).

(a)Position wire harness 21W4072 under pylon interface panel, remove protective covers ; connect D4952, D4956, D4961 to receptacles. Tighten connectors fingertight plus one-eight turn. Wirelock connector.
(b)Install harness, clamp (28), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(c)Connect electrical connector DS298 to IDG ADC pressure switch. Tighten connector fingertight plus one-eight turn. Wirelock connector. (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors.
(d)Install harness, clamps (26) and (28), attaching hardware on brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(e)Install harness, clamps, and attaching hardware on support brackets (24), (25) and (27). TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(f)Connect electrical connector DH7 to engine exciter and DH8 to ignitor exciter. Tighten connectors fingertight plus one-eight turn. Wirelock connectors (Ref. Fig. 408).

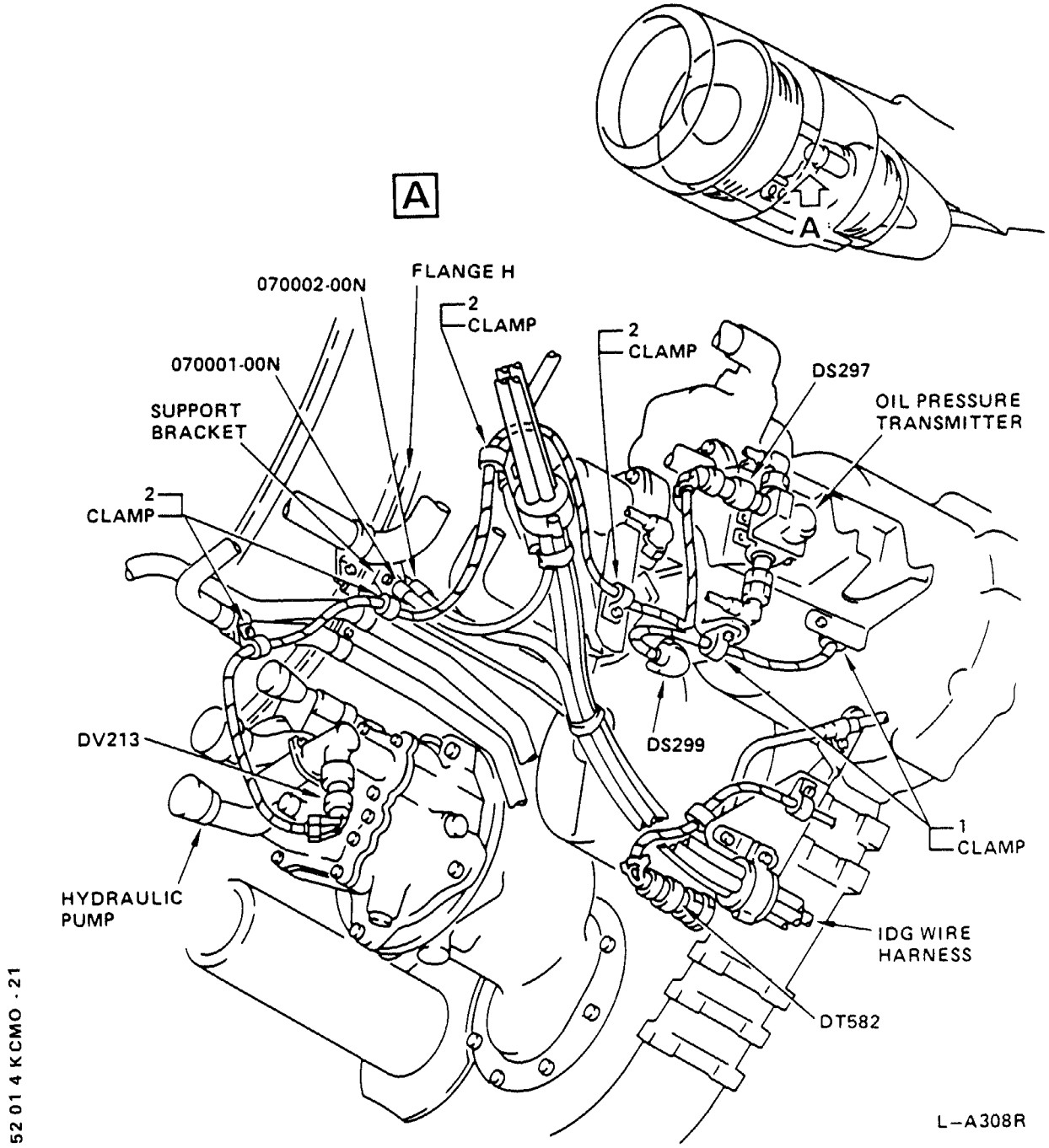


BM5 71 52 01 4 KAMA - 00

Engine Core Harness, Bottom Left (Sheet 1/2)
(Pre SB PW4NAC 71-107)
Figure 401

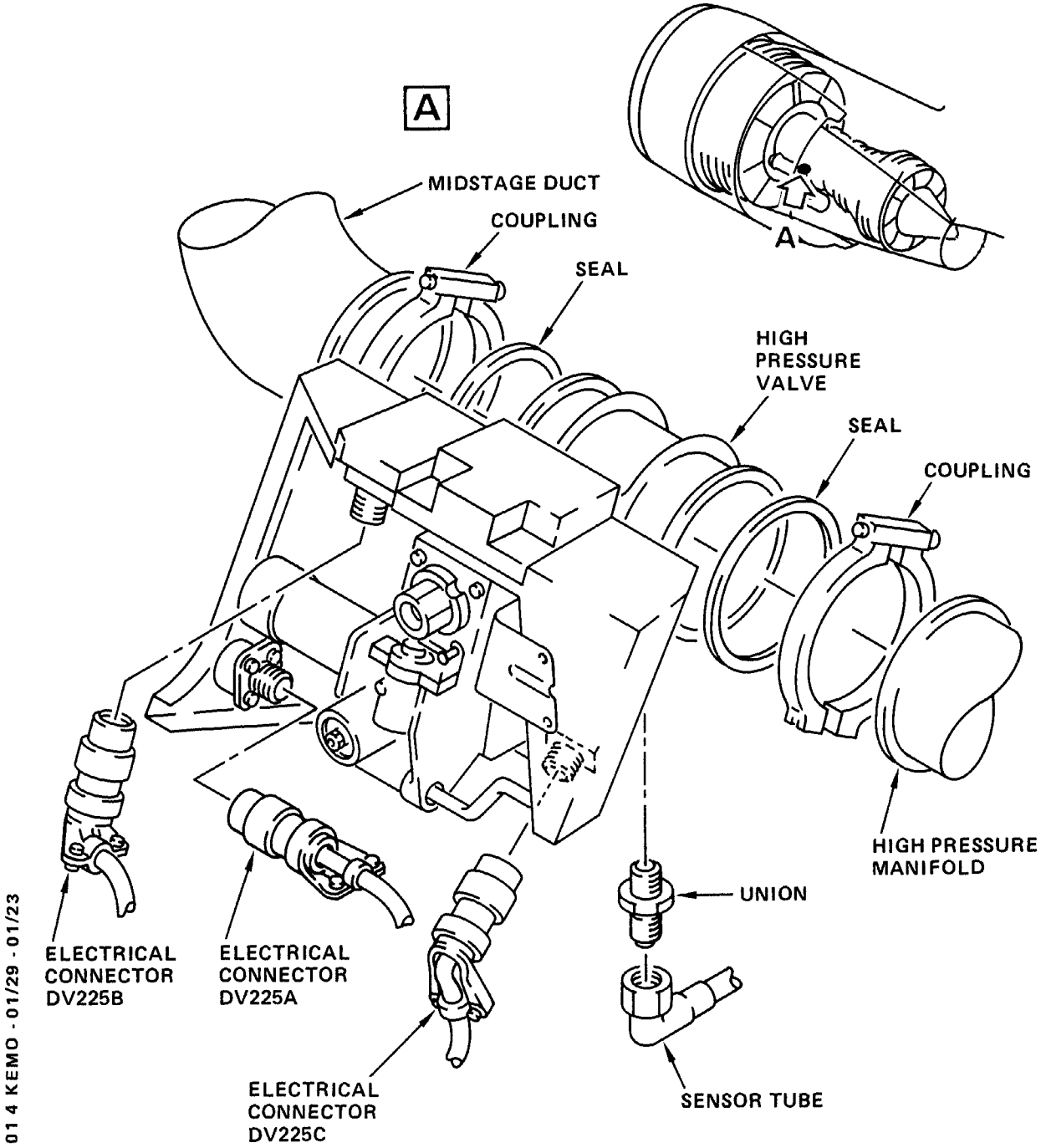


Engine Core Harness, Bottom Left (Sheet 2/2)
(Post SB PW4NAC 71-107)
Figure 401

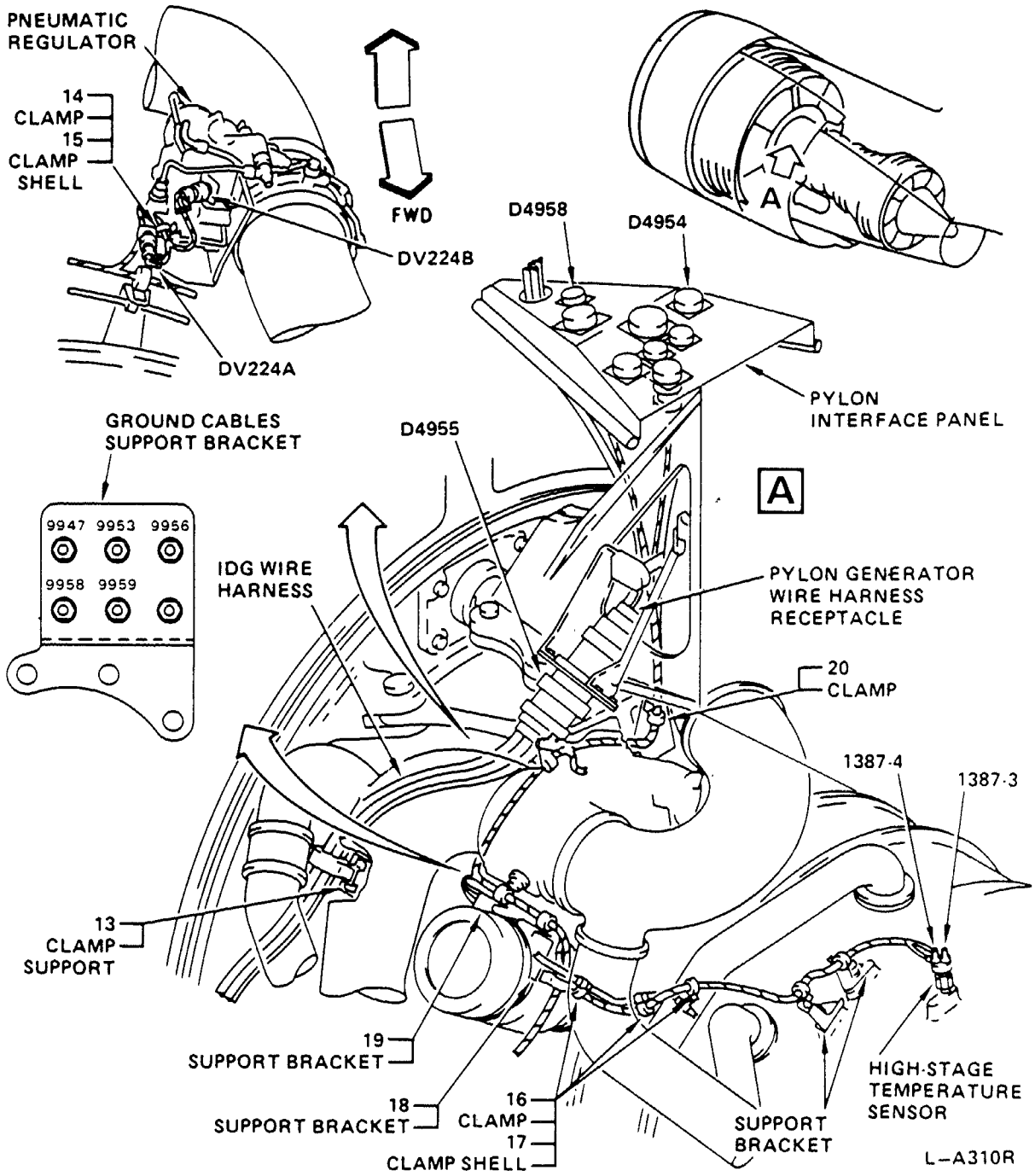


BM5 71 52 01 4 KCMO . 21

Engine Core Harness, Lower Left
(Pre SB PW4NAC 71-70)
Figure 402

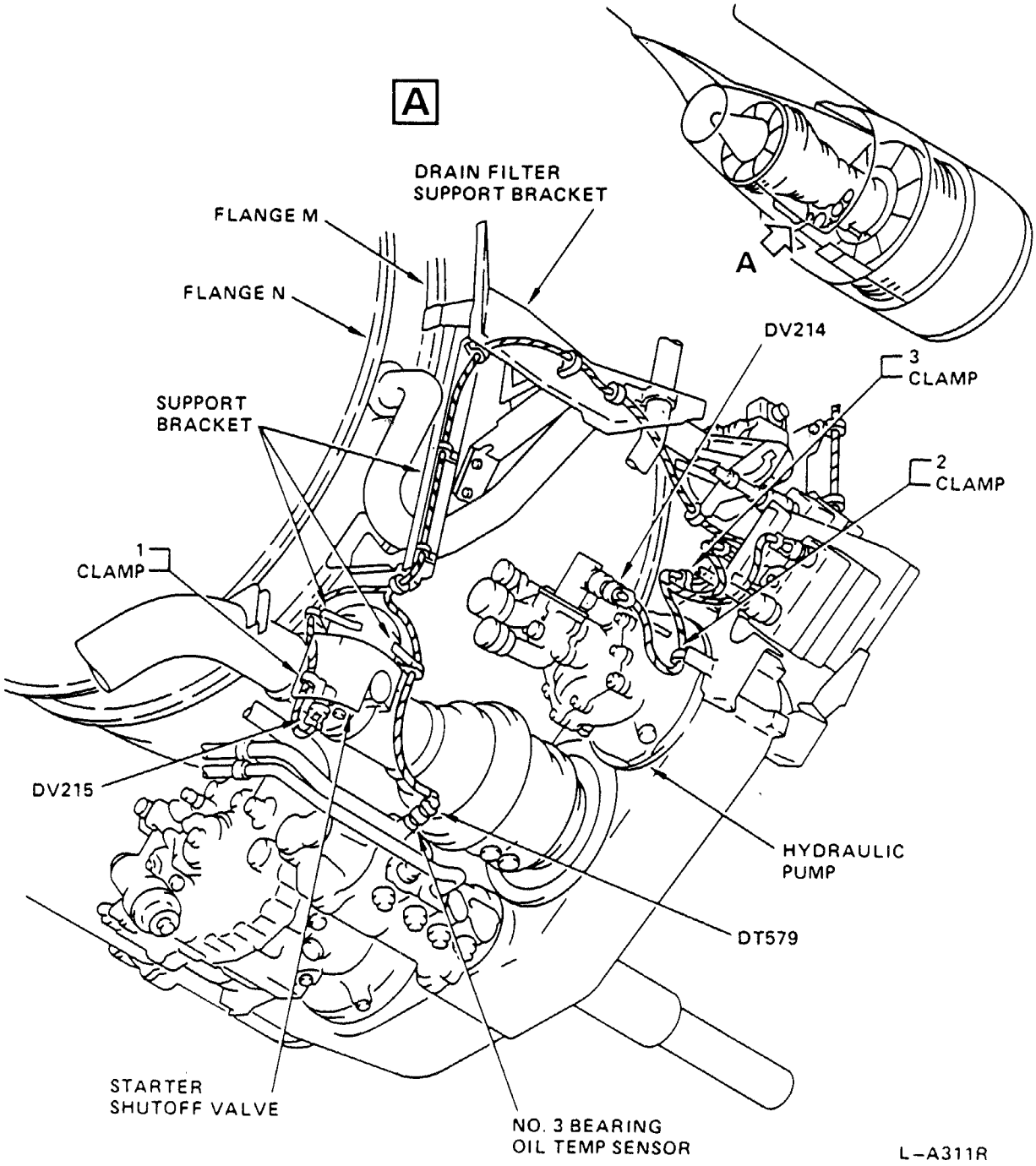


Engine Core Harness, Left
Figure 403

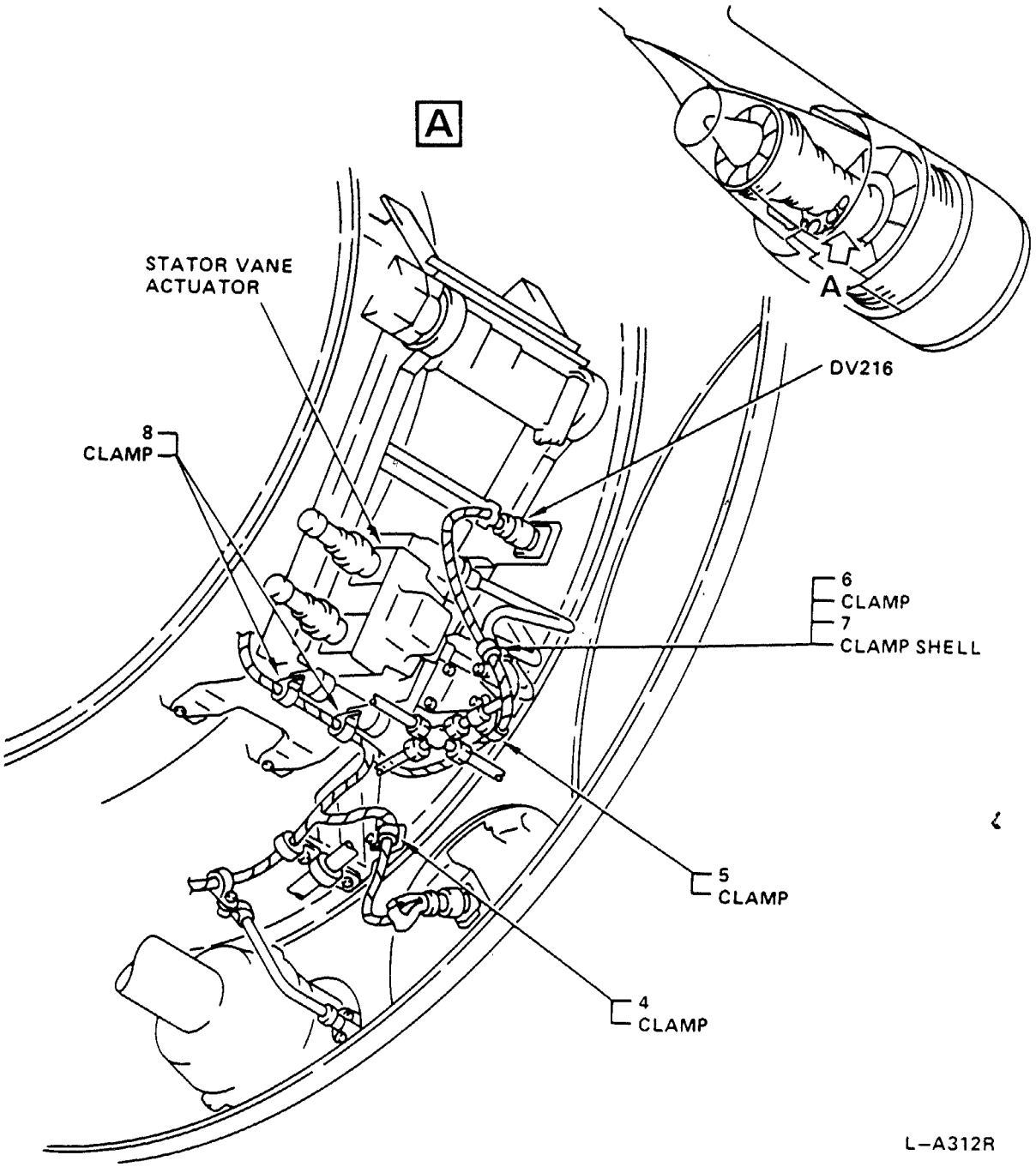


BM5 71 52 01 4 KGMO - 21

Engine Core Harness, Upper Left
(Pre SB PW4NAC 71-70)
Figure 404

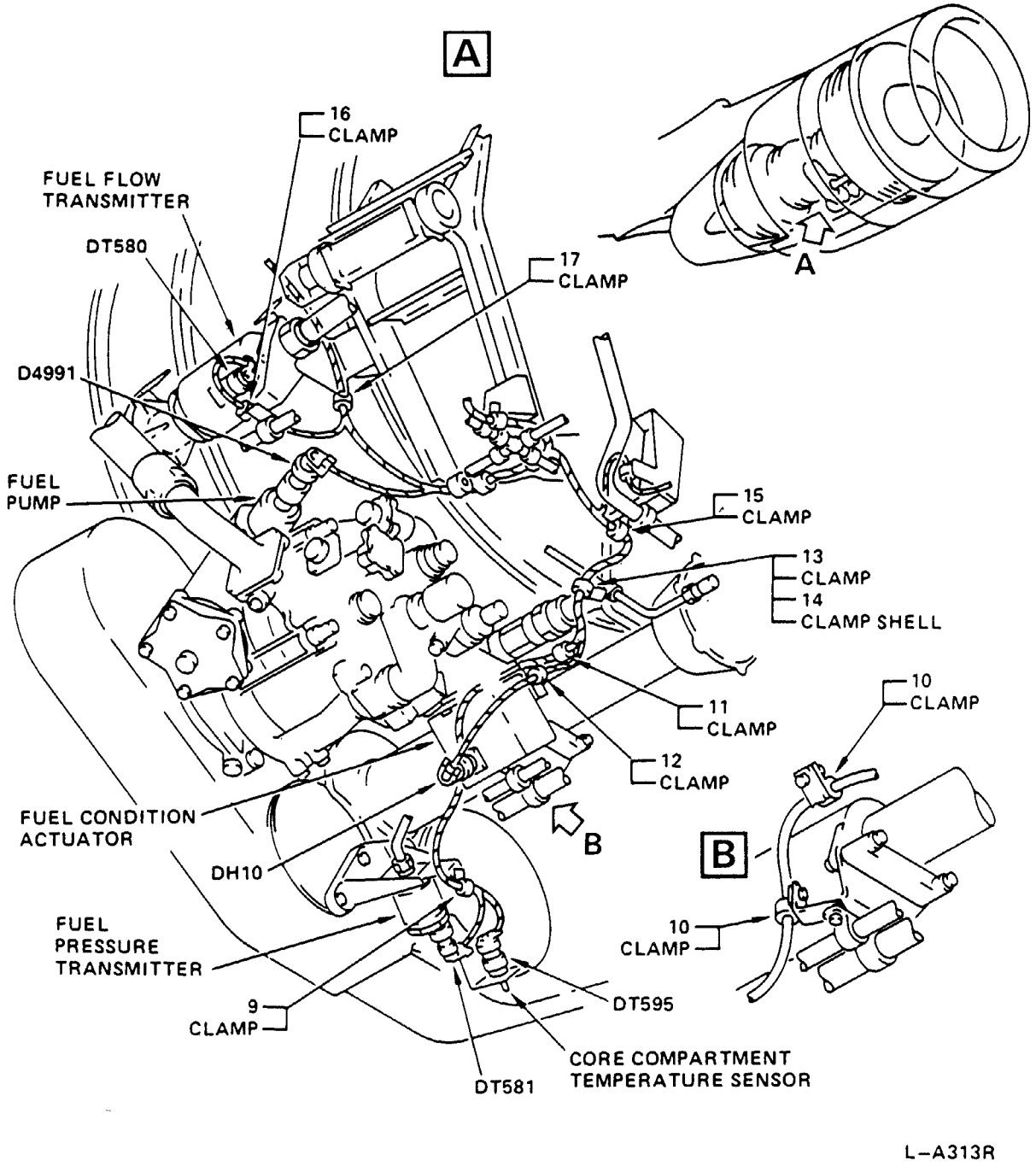


Engine Core Harness, Bottom Right
Figure 405



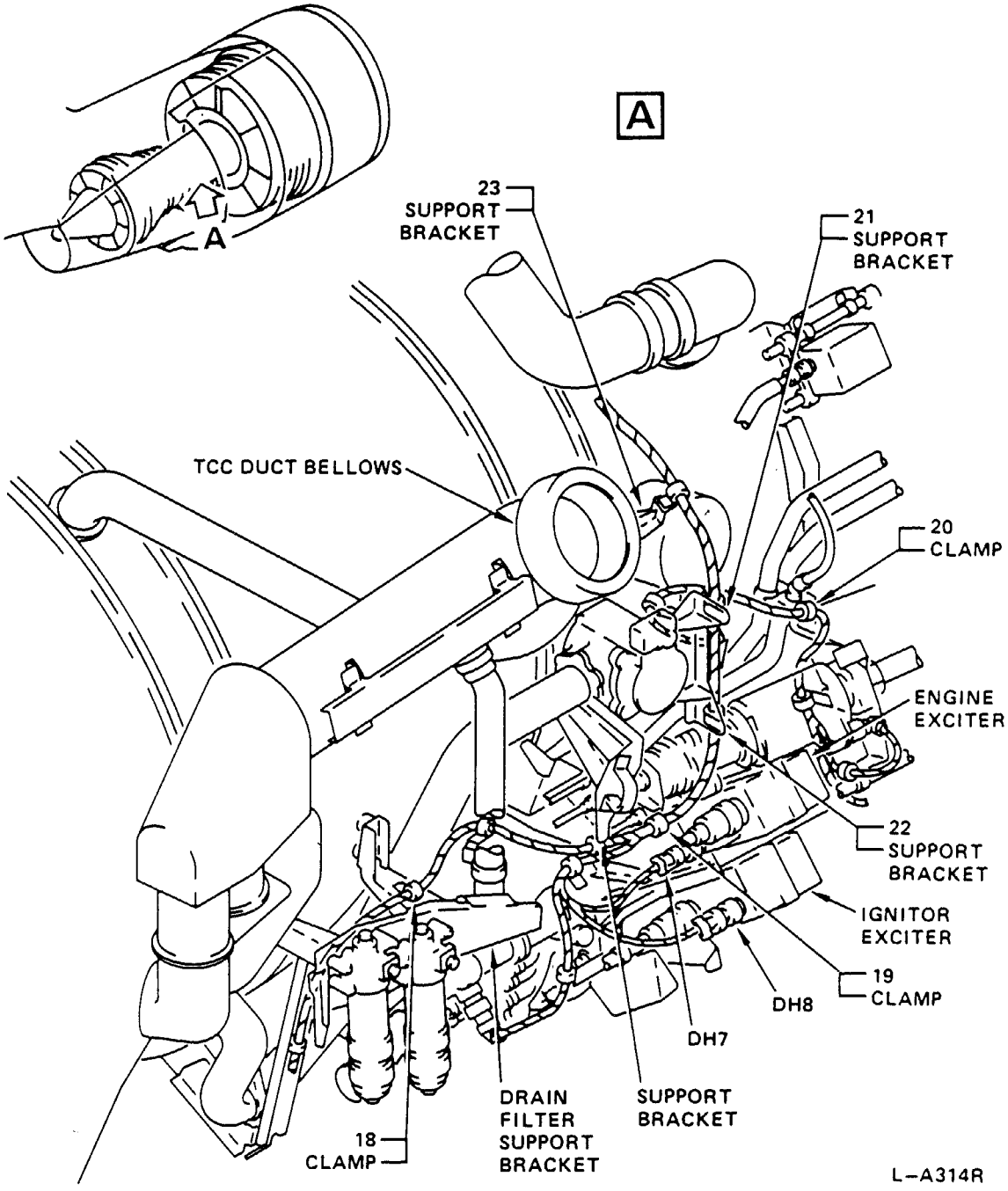
BM5 71 52 01 4 KLMO - 21

Engine Core Harness, Forward Lower Right
Figure 406



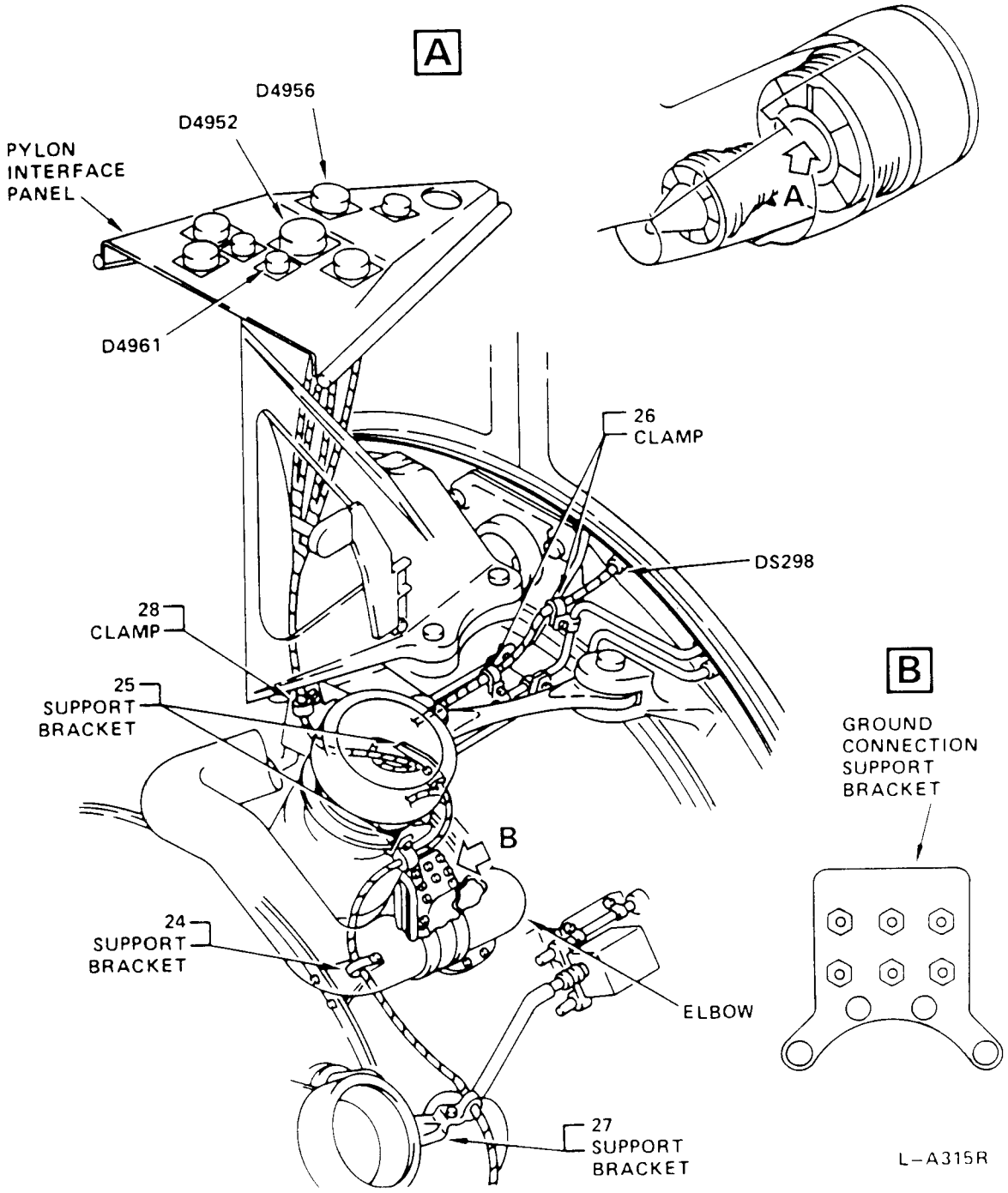
BM5 71 52 01 4 KNMO - 21

Engine Core Harness, Rear Lower Right
Figure 407



BM5 71 52 01 4 KPMO - 21

Engine Core Harness, Right
Figure 408



BM5 71 52 01 4 KRM0 03

Engine Core Harness, Upper Right
(Pre SB PW4NAC 71-70)
Figure 409

(g)Install harness, clamps, and attaching hardware on support bracket, support bracket (21), (22) and (23), and drain support bracket filter. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(h)Install harness, clamps (18), (19) and (20), and attaching hardware on support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(i)Connect electrical connectors DT580 to fuel flow transmitter, D4991 to fuel pump, DH10 to fuel condition actuator, (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors, DT595 to core compartment temperature sensor, and DT581 to fuel pressure transmitter. Tighten connectors fingertight plus one-eight turn. Wirelock connectors. (Ref. Fig. 407).
(j)Install harness, clamp (17) and attaching hardware on support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(k)Install harness, clamp (16) and attaching hardware on fuel flow transmitter bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(l)Install harness, clamps (15), (13), (11) and (10), clamp shell (14), and attaching hardware on tube support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(m)Install harness, clamp (12) and attaching hardware on fuel condition actuator support bracket.
TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(n)Install clamp (9) with attaching hardware on fuel pressure transmitter support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(o)Connect electrical connector DV216 to IDG ADC valve. Tighten connector fingertight plus one-eight turn. Wirelock connector (Ref. Fig. 406). (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors.
(p)Install harness, clamps (6) and (4), clamp shell (7), and attaching hardware on tube support brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(q)Install harness clamps (5) and (8), and attaching hardware on stator vane actuator support brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(r)Connect electrical connectors DV215 to starter shutoff valve, DT579 to No. 3 bearing oil temperature sensor, and DV214 to hydraulic pump. Tighten connectors fingertight plus one-eight turn. Wirelock connectors (Ref. Fig. 405).
(s)Install harness, clamp (3), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(t)Install harness, clamp (2), and attaching hardware on hydraulic pump support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(u)Install harness, clamps, and attaching hardware on support bracket, and drain filter support bracket. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(v)Install harness, clamp (1) and attaching hardware on starter shutoff valve cover. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41

m.daN).

(2)Install wire harnesses 21W4070, 21W4972 and 21W4114 on left side of engine core (Pre SB PWNAC 71-107) (Ref. Fig. 404).

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGTHNING PROTECTION.

(a)Position wire harness under pylon interface panel, remove protective covers from electrical plugs and receptacles for D4954 and D4958.

(b)Connect electrical plugs D4954 and D4958 to receptacles. Tighten connector fingertight plus one-eight turn. Wirelock connector.

(c)At base of pylon interface panel, remove protective covers from IDG electrical plug D4955 and receptacle for pylon generator wire harness.

(d)Connect IDG wire harness, 21W4114, electrical plug D4955 to pylon generator wire harness receptacle and tighten plug fingertight plus one-eight turn. Lockwire plug.

(e)Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(f)Connect electrical connectors DV224A and DV224B to pneumatic regulator. Tighten connectors fingertight plus one-eight turn. Wirelock connectors.

(g)Remove nuts and washers from high-stage temperature sensor terminals. Install terminal lugs, 1387-3 (yellow) on Post C and 1387-4 (red) on Post A, with attaching hardware. TORQUE nuts : for 1387-3 to between 20 and 22 lbf.in. (0.23 and 0.25 m.daN) and for 1387-4 to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).

(h)Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

(i)Install harness, clamps (14) and (16), clamp shells (15) and (17) and attaching hardware on tubing brackets.
TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(j)Install harness, clamps, and attaching hardware on support brackets and support brackets (18) and (19).
TORQUE nut to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).

(k)Install harness, clamp supports (13), and attaching hardware to brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(l)Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve, DT584 to oil quantity transmitter, (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors, and DT583 to oil pressure transmitter. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors
(Ref. Fig. 403).

(m)Install IDG harness, and clamp supports (13) with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(n)Install harness, clamps (8), (9), (11) and (12), clamp shell (10), spacers, and attaching hardware.

TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(o) Install harness, clamps and attaching hardware on support brackets (5), (6) and (7).

(p) Install harness, and clamps (3) and (4), with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(q) Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV213 to disconnect valve, and DT582 to oil temperature sensor.
Tighten connector fingertight plus one-eighth turn. Wirelock connector (Ref. Fig. 402).

(r) Install support bracket with ground studs 070001-00N and 070002-00N and attaching hardware on Flange H. TORQUE nuts to between 95 and 115 lbf. in. (1.08 and 1.29 m.daN).

(s) Install harness and clamps (1) and (2) with attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(t) Connect electrical connectors DG13A and DG13B to IDG. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 401) (Sheet 1/2).

(u) Connect power cables 070002-00N, 070003-00A, 070004-00B and 070005-00C to terminal block studs with nuts and washers. TORQUE nuts to between 144 and 168 lbf.in. (1.63 and 1.89 m.daN).

(v) Install terminal cover on IDG with screws and washers. TORQUE screws to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN).

(w) Install harness, clamps, and attaching hardware on support bracket, and clamp support (13). TORQUE bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(x) Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN), harness attaching hardware bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).

(y) Install harness support (13), harness, clamps and attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(3) Install wire harnesses 21W4070, 21W4072 and 21W4114 on left side of engine core (Post SB PWNAC 71-107) (Ref. Fig. 404).

(a) Position wire harness under pylon interface panel, remove protective covers from electrical plugs and receptacles for D4954 and D4958.

(b) Connect electrical plugs D4954 and D4958 to receptacles. Tighten connector fingertight plus one-eighth turn. Wirelock connector.

(c) At base of pylon interface panel, remove protective covers from IDG electrical plug D4955 and receptacle for pylon generator wire harness.

(d) Connect IDG wire harness, 21W4114, electrical plug D4955 to pylon generator wire harness receptacle and tighten plug fingertight plus one-eighth turn. Wirelock plug.

(e) Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(f) Connect electrical connectors DV224A and DV224B to pneumatic regulator. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors.

(g) Remove nuts and washers from high-stage temperature sensor terminals. Install terminal lugs, 1387-3 (yellow) on Post C and 1387-4 (red) on Post A with attaching hardware. TORQUE nuts : for 1387-3 to

between 20 and 22 lbf.in. (0.23 and 0.24 m.daN), for 1387-4 to 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(h) Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

(i) Install harness, clamps (14) and (16), clampshell (15) and (17) and attaching hardware on tubing brackets. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(j) Install harness, clamps, and attaching hardware on support brackets (18, 19). TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(k) Install harness, clamp supports (13), and attaching hardware to brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(l) Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve, and DT583 to oil pressure transmitter. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 403).

CAUTION : USE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR HARNESS CONNECTOR INSTALLATION (Ref. 70-00-00, P. BLOCK 201). USE OF INCORRECT ASSEMBLY PROCEDURE OR TOOLS, MAY DAMAGE OR LOOSEN CONNECTOR. LOOSE CONNECTORS PERMIT VIBRATION, WHICH CAN CAUSE EXCESSIVE CONTACT WEAR AND PRODUCE UNSATISFACTORY LIGHTNING PROTECTION.

(m) Connect electrical connector DT584 to oil quantity transmitter. (Ref. 70-00-00, P. Block 201).

(n) Install IDG harness and clamp supports (13) with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(o) Install harness, clamps (8), (9), (11), (12), clampshell (10), spacers, and attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(p) Install harness, clamp and attaching hardware on support brackets (5), (6) and (7).

(q) Install harness, clamps (3) and (4), with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(r) Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV213 to disconnect valve, and DT582 to oil temperature sensor. Tighten connector fingertight plus one-eighth turn. Wirelock connector (Ref. Fig. 402).

(s) Install support bracket with ground studs 070001-00N and 070002-00N and attaching hardware on Flange H. TORQUE nuts to between 95 and 115 lbf.in. (1.08 and 1.29 m.daN).

(t) Install harness and clamps (1) and (2) with attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(u) Connect electrical connector DG13A and DG13B to IDG. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 401) (Sheet 2/2).

(v) Install DG13B branch of harness with clamp and attaching hardware to IDG oil outlet tube assembly. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(w) Connect power cables 070002-00N, 070003-00A, 070004-00B and 070005-00C to terminal block studs with nuts and washers. TORQUE nuts to between

144 and 168 lbf.in. (1.63 and 1.89 m.daN).

(x) Install terminal cover on IDG with screws and washers. Using lower IDG terminal block cover screw and clamp, attach DG13B branch of harness to terminal cover. TORQUE screw to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN).

(y) Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN). TORQUE harness attaching hardware bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(z) Install harness support (13), harness, clamps and attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

E. Removal (Post SB PW4NAC 71-70) with IDG Harness in Two Pieces Configuration

(1) Remove wire harnesses 21W4114, 21W4070, and 21W4072 from left hand side of engine core (Pre SB PW4NAC 71-107) (Ref. Fig. 401) (Sheet 1/2).

(a) Remove terminal cover and attaching hardware from IDG.

(b) Remove nuts and washers attaching wires to IDG terminal studs and remove wires from studs.

(c) Disconnect connectors DG13A and DG13B from IDG. Install protective covers.

(d) Remove attaching hardware and clamps attaching harness to harness support.

(e) Remove cable guide bracket from support bracket.

(f) Remove attaching hardware and clamps attaching harness to support bracket.

(g) Remove bolts, washers, and nuts attaching wires 070001-00N and 070002-00N to ground studs (Ref. Fig. 410).

(h) Disconnect electrical connector DV214 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.

(i) Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.

(j) Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).

(k) Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.

(l) Remove attaching hardware and clamps attaching harnesses to brackets (5), (6) and (7).

(m) Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.

(n) Remove attaching hardware and clamp (8) attaching harness to engine.

(o) Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.

(p) Remove attaching hardware, clamps (9), (11) and (12), and clamp shell (10) attaching harnesses to engine.

(q) Remove attaching hardware and clamp supports (13) attaching IDG harness to brackets (Ref. Fig. 403, 410).

(r) Disconnect electrical connector D4955 from pylon generator wire harness receptacle. Remove IDG wire harness, 21W4070, from engine. Install

protective covers (Ref. Fig. 411).
(s)Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers.
(t)Remove attaching harware, clamps (14), and clamp shells (15) attaching harness to tubing bracket.
(u)Disconnect electrical connector D4961 from pylon generator wire harness receptacle.
(v)Remove nuts, washers and contacts from H29 high-stage temperature sensor terminals.
(w)Remove attaching hardware, clamps (16), and clamp shells (17) attaching hardware to tubing brackets.
(x)Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.
(y)Remove attaching hardware and clamp (20) attaching harness to engine bracket.
(z)Disconnect electrical plugs D4954 and D4958 from pylon interface panel receptacles. Remove wire harness 21W4070 and H29 high stage temperature sensor cable. Install protective covers.

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

E. Removal (Post SB PW4NAC 71-70) with IDG Harness in One Piece Configuration
(1)Remove wire harnesses 21W4114, 21W4070, and 21W4072 from left hand side of engine core (Pre SB PW4NAC 71-107) (Ref. Fig. 401) (Sheet 1/2).
(a)Remove terminal cover and attaching hardware from IDG.
(b)Remove nuts and washers attaching wires to IDG terminal studs and remove wires from studs.
(c)Disconnect connectors DG13A and DG13B from IDG. Install protective covers.
(d)Remove attaching hardware and clamps attaching harness to harness support.
(e)Remove cable guide bracket from support bracket.
(f)Remove attaching hardware and clamps attaching harness to support bracket.
(g)Remove bolts, washers, and nuts attaching wires 070001-00N and 070002-00N to ground studs (Ref. Fig. 410).
(h)Disconnect electrical connector DV214 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.
(i)Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.
(j)Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).
(k)Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.

(l)Remove attaching hardware and clamps attaching harnesses to brackets (5), (6) and (7).
(m)Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.
(n)Remove attaching hardware and clamp (8) attaching harness to engine.
(o)Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.
(p)Remove attaching hardware, clamps (9), (11) and (12), and clamp shell (10) attaching harnesses to engine.
(q)Remove attaching hardware and clamp supports (13) attaching IDG harness to brackets (Ref. Fig. 403, 410).
(r)Remove the IDG wire harness from pylon area as follows : (Ref. Fig. 414).
- Open the access doors 411DL (421DL), 411AZ (421AZ), 413AL (423AL) (Ref. 06-41-54, P. Block 1).
- Remove the bolt (11), the bolt (14), the washers (12) and nuts (13) attaching the half-clamps (15).
- Remove the bolt (3), the washer (4) and the nut (5) attaching the clamp (2) to the bracket.
- Untighten the nut attaching the harness to pylon fire shield. Retain the nut.
- Remove the screws (6), washers (7) and the screws (8) and washers (9) to remove cover from the pylon junction box.
- Disconnect the wires 070003-00A, 070004-00B, 070005-00C
R and 070001-00N from the junction box.
- Remove the hardware attaching the two clamps (1) to bracket.

(s)Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers. (Ref. Fig. 411)
(t)Remove attaching harware, clamps (14), and clamp shells (15) attaching harness to tubing bracket.
(u)Disconnect electrical connector D4961 from pylon generator wire harness receptacle.
(v)Remove nuts, washers and contacts from H29 high-stage temperature sensor terminals.
(w)Remove attaching hardware, clamps (16), and clamp shells (17) attaching hardware to tubing brackets.
(x)Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.
(y)Remove attaching hardware and clamp (20) attaching harness to engine bracket.
(z)Disconnect electrical plugs D4954 and D4958 from pylon interface panel receptacles. Remove wire harness 21W4070 and H29 high stage temperature sensor cable. Install protective covers.

**ON A/C 101-200,

(2)Remove wire harnesses 21W4114, 21W4070, and 21W4072 (Post SB PWNAC 71-107). (Ref. Fig. 401) (Sheet 2/2).
(a)Remove terminal cover and attaching hardware from IDG.
(b)Remove nuts and washers attaching wires to IDG terminals studs and remove wires from studs.

(c)Disconnect connectors DG13A and DG13B from IDG. Install protective covers.
(d)Remove attaching hardware and clamp attaching harness to IDG oil outlet tube assembly.
(e)Remove IDG terminal cover screw and clamp attaching harness to IDG terminal block cover.
(f)Remove cable guide bracket from support bracket.
(g)Remove attaching hardware and clamps attaching harness to support bracket.
(h)Remove bolts, washers, and nuts attaching wires 070001-00N and 070002-00N to ground studs (Ref. Fig. 410).
(i)Disconnect electrical connector DV214 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.
(j)Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.
(k)Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).
(l)Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.
(m)Remove attaching hardware and clamps attaching harnesses to brackets (5, 6 and 7).
(n)Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.
(o)Remove hardware and clamp (8) attaching harness to engine.
(p)Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.
(q)Remove attaching hardware, clamps (9), (11) and (12), and clampshell (10) attaching harnesses to engine.
(r)Remove attaching hardware and clamp supports (13) attaching IDG harness to brackets.
(s)Disconnect electrical connector D4955 from pylon generator wire harness receptacle. Remove IDG wire harness, 21W4070, from engine. Install protective covers (Ref. Fig. 411).
(t)Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers.
(u)Remove attaching harware, clamp (14), and clampshell (15) attaching hardware to tubing bracket.
(v)Disconnect electrical connector D4961 from pylon generator wire harness receptacle.
(w)Remove nuts, washers and contacts from H29 high-stage temperature sensor terminals.
(x)Remove attaching hardware, clamps (16), and clampshells (17) attaching hardware to tubing brackets.
(y)Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.
(z)Remove attaching hardware and clamp (20) attaching harness to engine bracket.
(aa)Disconnect electrical plugs D4954 and D4958 from pylon interface panel receptacles. Remove wire harness 21W4070 and H29 high stage temperature

sensor cable from engine. Install protective covers.

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

(2)Remove wire harnesses 21W4114, 21W4070, and 21W4072 (Post SB PWNAC 71-107). (Ref. Fig. 401) (Sheet 2/2).
(a)Remove terminal cover and attaching hardware from IDG.
(b)Remove nuts and washers attaching wires to IDG terminals studs and remove wires from studs.
(c)Disconnect connectors DG13A and DG13B from IDG. Install protective covers.
(d)Remove attaching hardware and clamp attaching harness to IDG oil outlet tube assembly.
(e)Remove IDG terminal cover screw and clamp attaching harness to IDG terminal block cover.
(f)Remove cable guide bracket from support bracket.
(g)Remove attaching hardware and clamps attaching harness to support bracket.
(h)Remove bolts, washers, and nuts attaching wires 070001-00N and 070002-00N to ground studs (Ref. Fig. 410).
(i)Disconnect electrical connector DV214 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.
(j)Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.
(k)Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).
(l)Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.
(m)Remove attaching hardware and clamps attaching harnesses to brackets (5, 6 and 7).
(n)Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.
(o)Remove hardware and clamp (8) attaching harness to engine.
(p)Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.
(q)Remove attaching hardware, clamps (9), (11) and (12), and clampshell (10) attaching harnesses to engine.
(r)Remove attaching hardware and clamp supports (13) attaching IDG harness to brackets.
(s)Remove the IDG wire harness from pylon area as follows : (Ref. Fig. 414).
- Open the access doors 411DL (421DL), 411AZ (421AZ), 413AZ (423AZ) (Ref. 06-41-54, P. Block 1).
- Remove the bolt (11), the bolt (14), the washers (12) and nuts (13) attaching the half-clamps (15).
- Remove the bolt (3), the washer (4) and the nut (5) attaching the

clamp (2) to the bracket.
- Untighten the nut attaching the harness to pylon fire shield. Retain the nut.
- Remove the screws (6), washers (7) and the screws (8) and washers (9) to remove cover from the pylon junction box.
- Disconnect the wires 070003-00A, 070004-00B, 070005-00C and 070002-00N from the junction box.
- Remove the hardware attaching the two clamps to bracket.

(t)Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers. (Ref. Fig. 411)
(u)Remove attaching harware, clamp (14), and clampshell (15) attaching hardware to tubing bracket.
(v)Disconnect electrical connector D4961 from pylon generator wire harness receptacle.
(w)Remove nuts, washers and contacts from H29 high-stage temperature sensor terminals.
(x)Remove attaching hardware, clamps (16), and clampshells (17) attaching hardware to tubing brackets.
(y)Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.
(z)Remove attaching hardware and clamp (20) attaching harness to engine bracket.
(aa)Disconnect electrical plugs D4954 and D4958 from pylon interface panel receptacles. Remove wire harness 21W4070 and H29 high stage temperature sensor cable from engine. Install protective covers.

**ON A/C 101-200,

(3)Remove electrical harness 21W4072, right hand side (Ref. Fig. 412).
(a)Disconnect connector DT579 from No. 3 bearing oil temperature sensor and electrical connector DV215 from starter shutoff valve. Install protective covers.
(b)Remove attaching hardware and clamp (1) attaching harness to starter shutoff valve cover.
(c)Remove attaching hardware and clamps attaching harness to support brackets, drain filters support bracket, and bracket on Flange M.
(d)Disconnect connector DV213 from hydraulic pump. Install protective covers.
(e)Remove attaching hardware and clamps (2) and (3) attaching harness to support bracket and hydraulic pump.
(f)Remove attaching hardware and clamps (4) and (6) attaching harness to stator vane actuator support bracket ; and clamps (5) and (7) attaching harness to tube support brackets (Ref. Fig. 406).
(g)Disconnect electrical connector DV216 from IDG ADC valve. Install protective covers.
(h)Disconnect connector DT581 from fuel pressure transmitter and electrical connector DT595 from core compartment temperature sensor. Install protective covers (Ref. Fig. 407).
(i)Remove attaching hardware and clamps (9) and (10) attaching harness to fuel pressure transmitter support bracket and tube support bracket.
(j)Disconnect connector DH10 from fuel condition actuator. Install

protective covers.

(k)Remove attaching hardware, clamps (11), (13) and (15), and clamp shell (14) attaching harness to tube support brackets and clamp (12) attaching harness to fuel condition actuator support bracket.

(l)Disconnect connector D4991 from fuel pump and connector DT580 from fuel pump and connector DT580 from fuel flow transmitter. Install protective covers.

(m)Remove attaching hardware and clamps (16) and (17) attaching harness to fuel flow transmitter support bracket.

(n)Remove attaching hardware and clamp (18) attaching harness to drain filters support bracket and support bracket (Ref. Fig. 408).

(o)Disconnect electrical connector DH8 from ignitor exciter and electrical connector DH7 from engine exciter. Install protective covers.

(p)Remove attaching hardware and clamps (19) and (20) attaching harness to brackets ; and clamps attaching harness to brackets (21), (22) and (23).

(q)Remove attaching hardware and clamps attaching electrical harness to support brackets (24), (25) and (27) (Ref. Fig. 413).

(r)Remove ground connection support bracket with ground connections attached.

(s)Remove attaching hardware, clamps (26), (27) and (28) and clamp shells (27) attaching harness to existing brackets.

(t)Disconnect electrical DS298 from IDG ADC pressure switch. Install protective covers.

(u)Disconnect electrical plugs D4952, D4956 and D4961 from pylon interface panel receptacles. Install protective covers.

(v)Remove wire harness 21W4072 from right side of engine core.

F. Installation (Post SB PW4NAC 71-70) with IDG Harness in Two Pieces Configuration

(1)Install wire harness 21W4072 (Ref. Fig. 413).

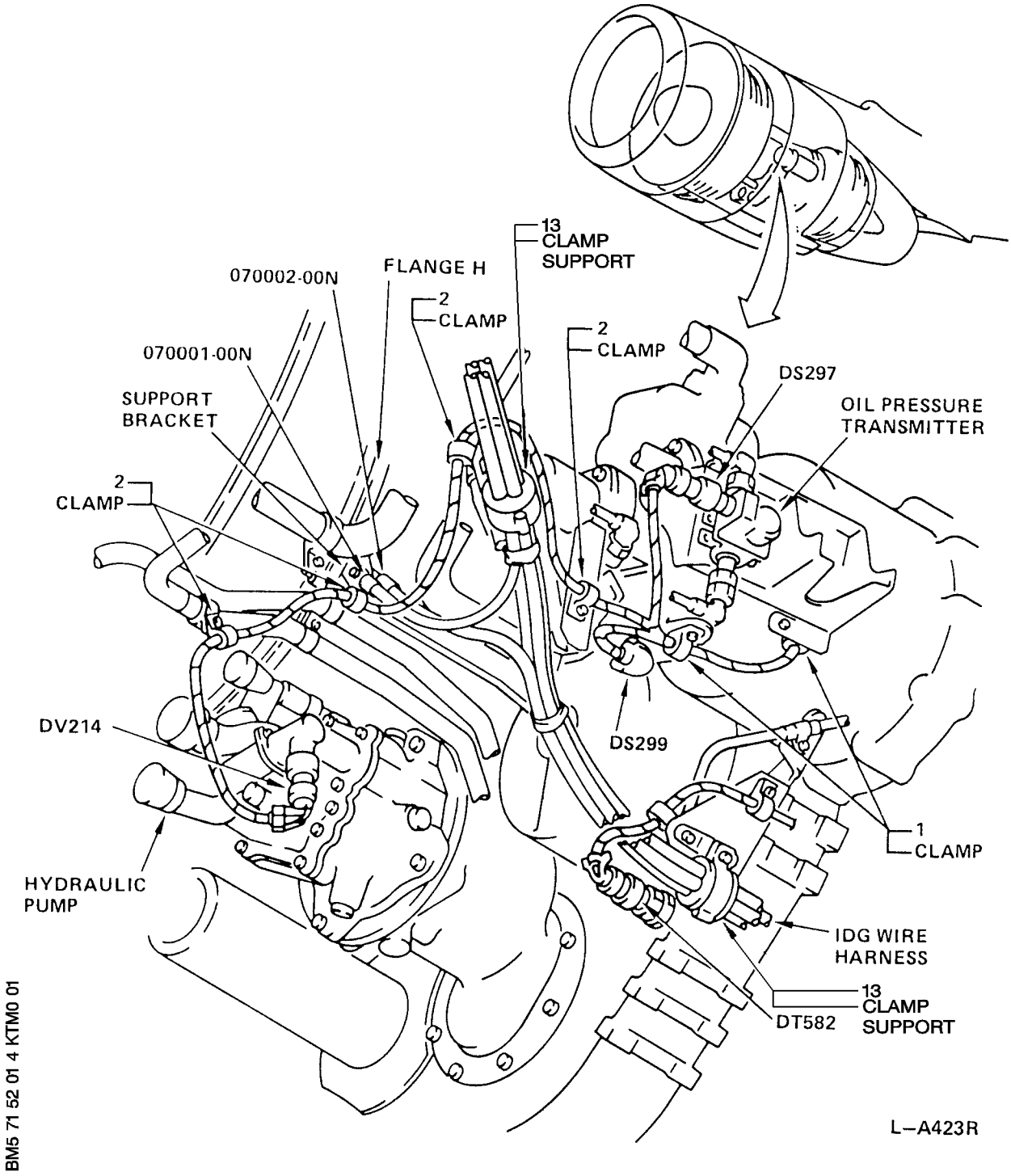
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

NOTE : Be sure you connect the proper connector to the proper receptacle. The D4952P connector/receptacle is rearward of the D4956P connector. Use the color codes on the connector and receptacle if equipped (Post SB PW4 NAC 71-87) (Ref. Fig. 413).

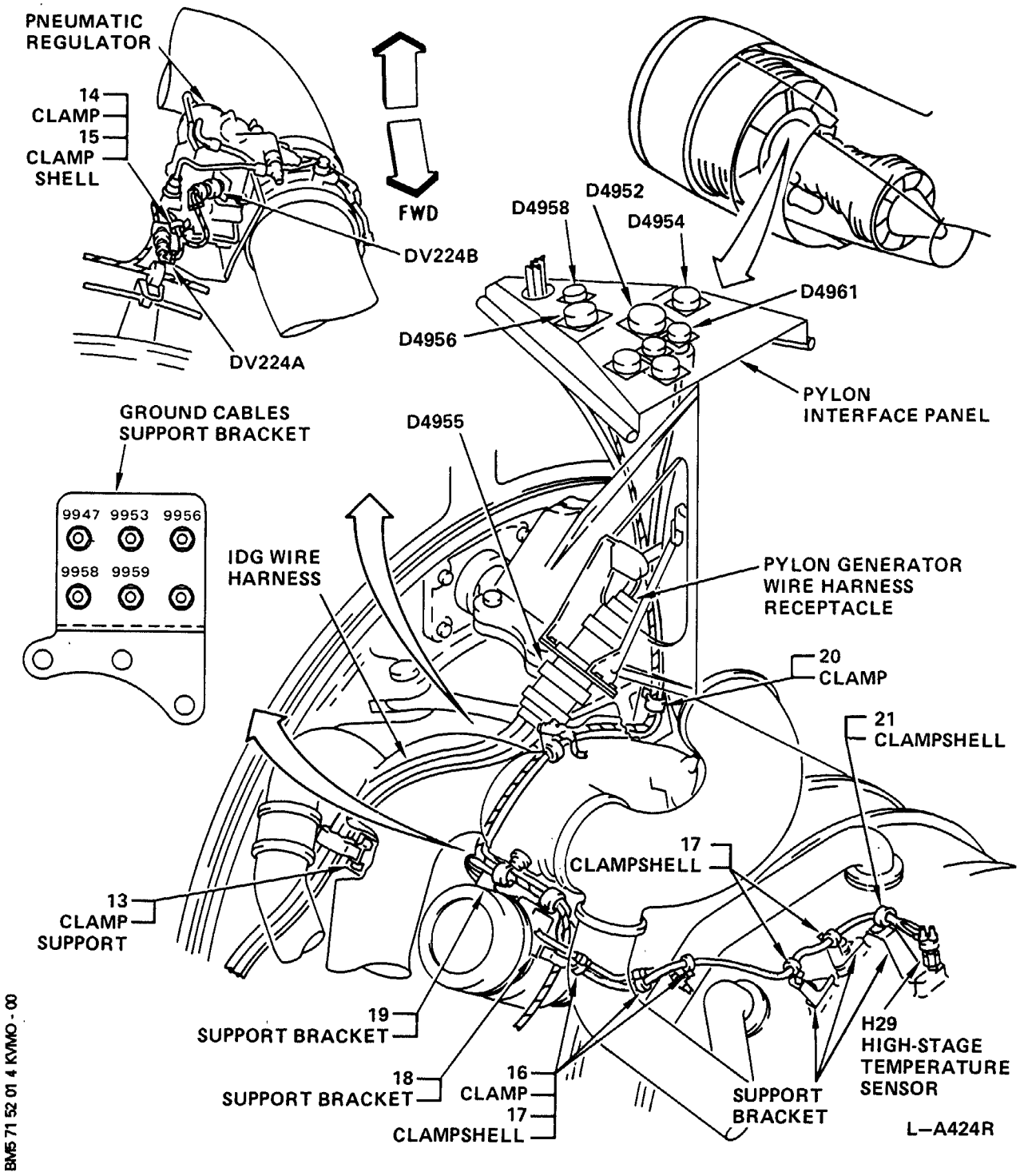
(a)Position wire harness 21W4072 under pylon interface panel, remove protective covers ; connect D4952, and D4956 to receptacles. Tighten connectors fingertight plus one-eight turn. Wirelock connector.

(b)Install harness, clamp (28), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

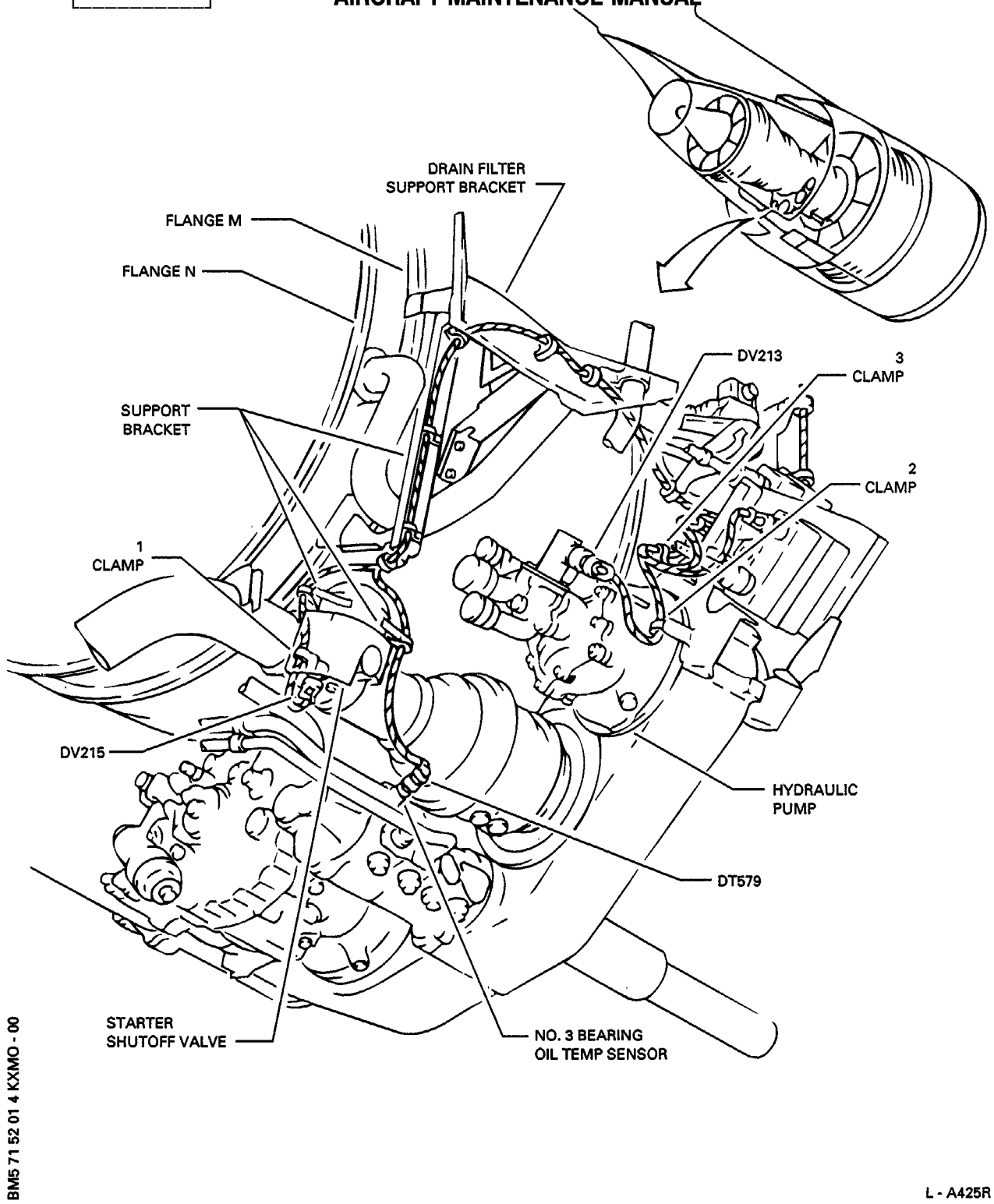
(c)Connect electrical connector DS298 to IDG ADC pressure switch. Tighten connector fingertight plus one-eight turn. Wirelock connector. (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors.



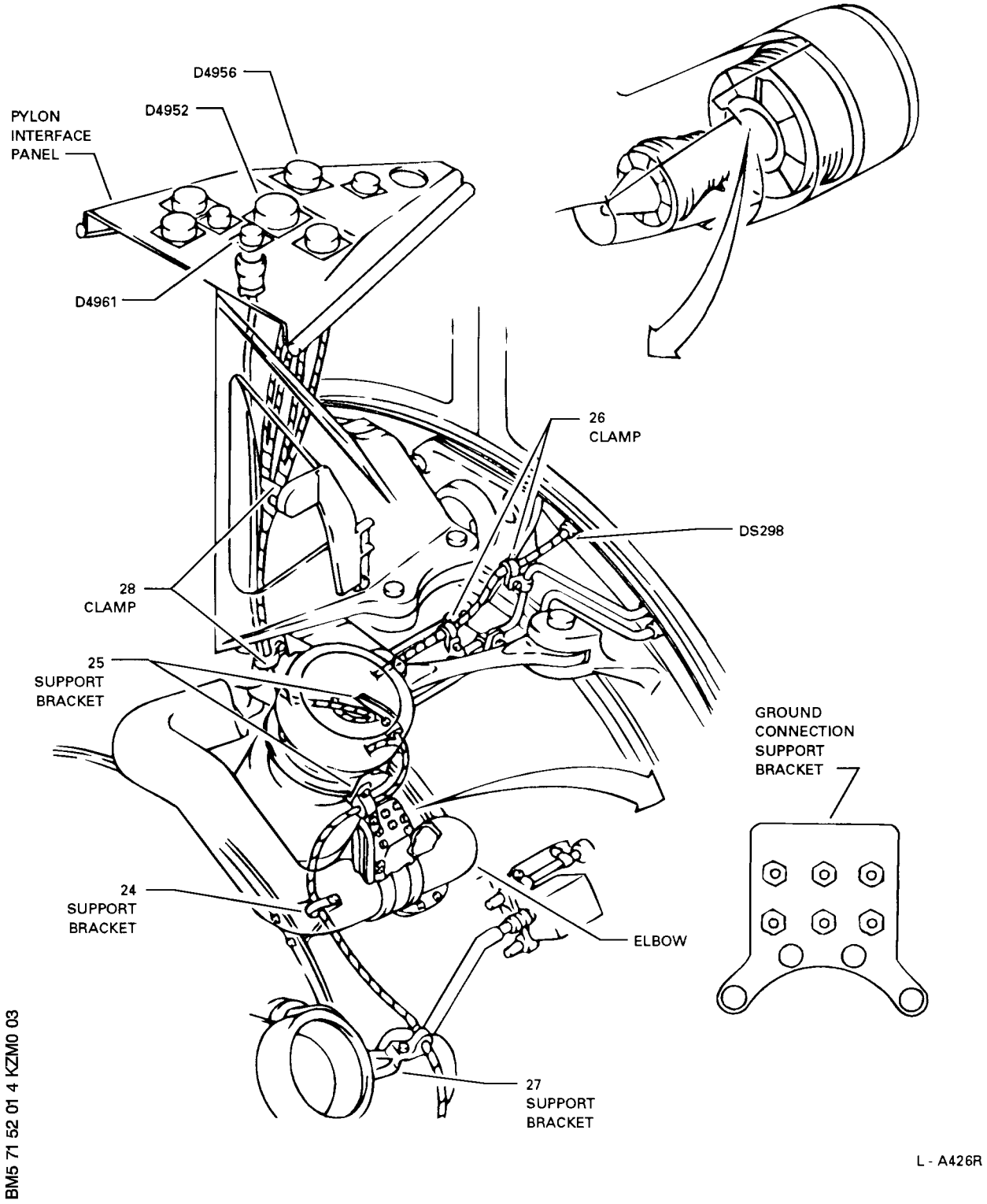
Engine Core Harness, Lower Left
(Post SB PW4NAC 71-70)
Figure 410



Engine Core Harness, Upper Left
(Post SB PW4NAC 71-70)
Figure 411



Engine Core Harness, Lower Right
(Post SB PW4NAC 71-70)
Figure 412



Engine Core Harness, Upper Right
(Post SB PW4NAC 71-70)
Figure 413

(d)Install harness, clamps (26) and (28), attaching hardware on brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(e)Install harness, clamps, and attaching hardware on support brackets (24), (25) and (27). TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(f)Connect electrical connector DH7 to engine exciter and DH8 to ignitor exciter. Tighten connectors fingertight plus one-eight turn. Wirelock connectors (Ref. Fig. 408).
(g)Install harness, clamps, and attaching hardware on support bracket, support bracket (21), (22) and (23), and drain support bracket filter. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(h)Install harness, clamps (18), (19) and (20), and attaching hardware on support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(i)Connect electrical connectors DT580 to fuel flow transmitter, D4991 to fuel pump, DH10 to fuel condition actuator (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors, DT595 to core compartment temperature sensor, and DT581 to fuel pressure transmitter. Tighten connectors fingertight plus one-eight turn. Wirelock connectors. (Ref. Fig. 407).
(j)Install harness, clamp (17) and attaching hardware on support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(k)Install harness, clamp (16) and attaching hardware on fuel flow transmitter bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(l)Install harness, clamps (15), (13), (11) and (10), clamp shell (14), and attaching hardware on tube support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(m)Install harness, clamp (12) and attaching hardware on fuel condition actuator support bracket.
TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(n)Install clamp (9) with attaching hardware on fuel pressure transmitter support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(o)Connect electrical connector DV216 to IDG ADC valve. Tighten connector fingertight plus one-eight turn. Wirelock connector (Ref. Fig. 406). (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors.
(p)Install harness, clamps (6) and (4), clamp shell (7), and attaching hardware on tube support brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(q)Install harness clamps (5) and (8), and attaching hardware on stator vane actuator support brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(r)Connect electrical connectors DV215 to starter shutoff valve, DT579 to No. 3 bearing oil temperature sensor, and DV213 to hydraulic pump. Tighten connectors fingertight plus one-eight turn. Wirelock connectors (Ref. Fig. 405).
(s)Install harness, clamp (3), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(t)Install harness, clamp (2), and attaching hardware on hydraulic pump support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(u)Install harness, clamps, and attaching hardware on support bracket, and drain filter support bracket. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(v)Install harness, clamp (1) and attaching hardware on starter shutoff valve cover. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

F. Installation (Post SB PW4NAC 71-70) with IDG Harness in One Piece Configuration
(1)Install wire harness 21W4072 (Ref. Fig. 413).
CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.
NOTE : Be sure you connect the proper connector to the proper receptacle. The D4952P connector/receptacle is rearward of the D4956P connector. Use the color codes on the connector and receptacle if equipped (Post SB PW4 NAC 71-87) (Ref. Fig. 413).
(a)Position wire harness 21W4072 under pylon interface panel, remove protective covers ; connect D4952, and D4956 to receptacles. Tighten connectors fingertight plus one-eight turn. Wirelock connector.
(b)Install harness, clamp (28), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(c)Connect electrical connector DS298 to IDG ADC pressure switch. Tighten connector fingertight plus one-eight turn. Wirelock connector. (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors.
(d)Install harness, clamps (26) and (28), attaching hardware on brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(e)Install harness, clamps, and attaching hardware on support brackets (24), (25) and (27). TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(f)Connect electrical connector DH7 to engine exciter and DH8 to ignitor exciter. Tighten connectors fingertight plus one-eight turn. Wirelock connectors (Ref. Fig. 408).
(g)Install harness, clamps, and attaching hardware on support bracket, support bracket (21), (22) and (23), and drain support bracket filter. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(h)Install harness, clamps (18), (19) and (20), and attaching hardware on support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and

0.41 m.daN).

(i)Connect electrical connectors DT580 to fuel flow transmitter, D4991 to fuel pump, DH10 to fuel condition actuator (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors, DT595 to core compartment temperature sensor, and DT581 to fuel pressure transmitter. Tighten connectors fingertight plus one-eight turn. Wirelock connectors. (Ref. Fig. 407).

(j)Install harness, clamp (17) and attaching hardware on support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(k)Install harness, clamp (16) and attaching hardware on fuel flow transmitter bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(l)Install harness, clamps (15), (13), (11) and (10), clamp shell (14), and attaching hardware on tube support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(m)Install harness, clamp (12) and attaching hardware on fuel condition actuator support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(n)Install clamp (9) with attaching hardware on fuel pressure transmitter support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(o)Connect electrical connector DV216 to IDG ADC valve. Tighten connector fingertight plus one-eight turn. Wirelock connector (Ref. Fig. 406). (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors.

(p)Install harness, clamps (6) and (4), clamp shell (7), and attaching hardware on tube support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(q)Install harness clamps (5) and (8), and attaching hardware on stator vane actuator support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(r)Connect electrical connectors DV215 to starter shutoff valve, DT579 to No. 3 bearing oil temperature sensor, and DV213 to hydraulic pump. Tighten connectors fingertight plus one-eight turn. Wirelock connectors (Ref. Fig. 405).

(s)Install harness, clamp (3), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(t)Install harness, clamp (2), and attaching hardware on hydraulic pump support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(u)Install harness, clamps, and attaching hardware on support bracket, and drain filter support bracket. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(v)Install harness, clamp (1) and attaching hardware on starter shutoff valve cover. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

**ON A/C 101-200,

(2)Install wire harnesses 21W4070, 21W4072 and 21W4114 on left side of

engine core (Pre SB PW4NAC 71-107) (Ref. Fig. 411).

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(a) Position wire harness under pylon interface panel, remove protective covers from electrical plugs and receptacles for D4954, D4958 and D4961.

(b) Connect electrical plugs D4954, D4958 and D4961 to receptacles. Tighten connnector fingertight plus one-eight turn. Wirelock connector.

(c) At base of pylon interface panel, remove protective covers from IDG electrical plug D4955 and receptacle for pylon generator wire harness.

(d) Connect IDG wire harness, 21W4114, electrical plug D4955 to pylon generator wire harness receptacle and tighten plug fingertight plus one-eight turn. Lockwire plug.

(e) Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(f) Connect electrical connectors DV224A and DV224B to pneumatic regulator. Tighten connectors fingertight plus one-eight turn. Wirelock connectors.

(g) Remove nuts and washers from H29 high-stage temperature sensor terminals.
Install terminal lugs, yellow on Post C and red on post A, with attaching hardware. TORQUE nuts : for Post C to between 20 and 22 lbf.in. (0.23 and 0.25 m.daN) and for Post A to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).

(h) Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

(i) Install harness, clamps (14) and (16), clamp shells (15) and (17) and attaching hardware on tubing brackets.
TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(j) Install harness, clamps, and attaching hardware on support brackets and support brackets (18) and (19).
TORQUE nut to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).

(k) Install harness, clamp supports (13), and attaching hardware to brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(l) Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve, DT584 to oil quantity transmitter (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors, and DT583 to oil pressure transmitter. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors
(Ref. Fig. 403).

(m) Install IDG harness, and clamp supports (13) with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(n) Install harness, clamps (8), (9), (11) and (12), clamp shell (10), spacers, and attaching hardware.

TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(o)Install harness, clamps and attaching hardware on support brackets (5), (6) and (7).

(p)Install harness, and clamps (3) and (4), with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(q)Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV214 to disconnect valve, and DT582 to oil temperature sensor.
Tighten connector fingertight plus one-eighth turn. Wirelock connector (Ref. Fig. 410).

(r)Install support bracket with ground studs 070001-00N and 070002-00N and attaching hardware on Flange H. TORQUE nuts to between 95 and 115 lbf. in. (1.08 and 1.29 m.daN).

(s)Install harness and clamps (1) and (2) with attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(t)Connect electrical connectors DG13A and DG13B to IDG. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 401).

(u)Connect power cables 070002-00N, 070003-00A, 070004-00B and 070005-00C to terminal block studs with nuts and washers. TORQUE nuts to between 144 and 168 lbf.in. (1.63 and 1.89 m.daN).

(v)Install terminal cover on IDG with screws and washers. TORQUE screws to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN).

(w)Install harness, clamps, and attaching hardware on support bracket, and clamp support (13). TORQUE bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(x)Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN), harness attaching hardware bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).

(y)Install harness support (13), harness, clamps and attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

(2)Install wire harnesses 21W4070, 21W4072 and 21W4114 on left side of engine core (Pre SB PW4NAC 71-107) (Ref. Fig. 411).

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(a)Position wire harness under pylon interface panel, remove protective covers from electrical plugs and receptacles for D4954, D4958 and D4961.

(b)Connect electrical plugs D4954, D4958 and D4961 to receptacles. Tighten connnector fingertight plus one-eight turn. Wirelock connector.

(c)Install the IDG wire harness at pylon area as follows :
(Ref. Fig. 414).
- Position the harness onto the pylon fire shield and secure with the nut.
TORQUE nut to between 133 and 256 lbf.in. (1.5 and 2.9 m.daN).
- At pylon junction box, connect the wire 070003-00A to terminal block stud 1, wire 070004-00B to stud 2, wire 070005-00C to stud 3 and
R wire 070001-00N to stud 4 with nuts and washers.
TORQUE nuts to between 178 and 194 lbf.in (2 and 2.2 m.daN). Install the terminal cover.
- Install the cover onto the junction box and secure with the screws (6), washers (7) and the screws (8) and the washers (9). TORQUE the screws (6) and (8) to between 21 and 23 lbf.in. (0.23 and 0.26 m.daN).
- Install the clamp (2) on grommet and attach the clamp with the bolt, the washer (4) and the nut (5) to bracket. TORQUE the nut to between 31 and 40 lbf.in. (0.35 and 0.45 m.daN).
- Install the clamp (15) on grommet, secure with the bolt (11), the washers (12) and the nut (13).
- Assemble the clamps (15) and (16) with the bolt (14) the washer (12) and the nut (13).
TORQUE the two nuts to between 31 and 40 lbf.in. (0.35 and 0.45 m.daN).
- Install the two clamps (1) with screws and washers onto the bracket.
TORQUE the screws to between 38 and 47 lbf.in. (0.42 and 0.54 m.daN).
- Seal the wires at the output of the junction box with Material No. 08-004 (Ref. 20-31-00, P. Block 1).
- Close the access doors 411DL (421DL), 411AZ (421AZ), 413AL (423AL) (Ref. 06-41-54, P. Block 1).

(d)Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(Ref. Fig. 411)

(e)Connect electrical connectors DV224A and DV224B to pneumatic regulator. Tighten connectors fingertight plus one-eight turn. Wirelock connectors.

(f)Remove nuts and washers from H29 high-stage temperature sensor terminals.
Install terminal lugs, yellow on Post C and red on post A, with attaching hardware. TORQUE nuts : for Post C to between 20 and 22 lbf.in. (0.23 and 0.25 m.daN) and for Post A to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).

(g)Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

(h)Install harness, clamps (14) and (16), clamp shells (15) and (17) and attaching hardware on tubing brackets.
TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(i)Install harness, clamps, and attaching hardware on support brackets and support brackets (18) and (19).
TORQUE nut to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).

(j)Install harness, clamp supports (13), and attaching hardware to

brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(k)Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve, DT584 to oil quantity transmitter (Ref. 70-00-00, P. Block 201) Installation of MIL-C-26500 or MIL-C-38999 Series Electrical Harness Connectors, and DT583 to oil pressure transmitter. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 403).

(l)Install IDG harness, and clamp supports (13) with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(m)Install harness, clamps (8), (9), (11) and (12), clamp shell (10), spacers, and attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(n)Install harness, clamps and attaching hardware on support brackets (5), (6) and (7).

(o)Install harness, and clamps (3) and (4), with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(p)Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV214 to disconnect valve, and DT582 to oil temperature sensor. Tighten connector fingertight plus one-eighth turn. Wirelock connector (Ref. Fig. 410).

(q)Install support bracket with ground studs 070001-00N and 070002-00N and attaching hardware on Flange H. TORQUE nuts to between 95 and 115 lbf. in. (1.08 and 1.29 m.daN).

(r)Install harness and clamps (1) and (2) with attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(s)Connect electrical connectors DG13A and DG13B to IDG. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 401).

(t)Connect power cables 070002-00N, 070003-00A, 070004-00B and 070005-00C to terminal block studs with nuts and washers. TORQUE nuts to between 144 and 168 lbf.in. (1.63 and 1.89 m.daN).

(u)Install terminal cover on IDG with screws and washers. TORQUE screws to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN).

(v)Install harness, clamps, and attaching hardware on support bracket, and clamp support. TORQUE bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(w)Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN), harness attaching hardware bolts to between 20 and 25 lbf. in. (0.23 and 0.28 m.daN).

(x)Install harness support (13), harness, clamps and attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

**ON A/C 101-200,

(3)Install wire harnesses 21W4070, 21W4072 and 21W4114 on left side of engine core (Post SB PWNAC 71-107) (Ref. Fig. 411).

(a)Position wire harness under pylon interface panel, remove protective

covers from electrical plugs and receptacles for D4954, D4958 and D4961.

(b) Connect electrical plugs D4954, D4958 and D4961 to receptacles. Tighten connnector fingertight plus one-eighth turn. Wirelock connector.

(c) At base of pylon interface panel, remove protective covers from IDG electrical plug D4955 and receptacle for pylon generator wire harness.

(d) Connect IDG wire harness, 21W4114, electrical plug D4955 to pylon generator wire harness receptacle and tighten plug fingertight plus one-eighth turn. Wirelock plug.

(e) Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(f) Connect electrical connectors DV224A and DV224B to pneumatic regulator. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors.

(g) Remove nuts and washers from H29 high-stage temperature sensor terminals. Install terminal lugs, yellow on Post C and red on Post A with attaching hardware. TORQUE nuts : for Post C to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN) and for Post A to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(h) Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

(i) Install harness, clamps (14) and (16), clampshell (15) and (17) and attaching hardware on tubing brackets. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(j) Install harness, clamps, and attaching hardware on support brackets (18) and (19). TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(k) Install harness, clamp supports (13), and attaching hardware to brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(l) Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve, and DT583 to oil pressure transmitter. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 403).

CAUTION : USE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR HARNESS CONNECTOR INSTALLATION (Ref. 70-00-00, P. BLOCK 201). USE OF INCORRECT ASSEMBLY PROCEDURE OR TOOLS, MAY DAMAGE OR LOOSEN CONNECTOR. LOOSE CONNECTORS PERMIT VIBRATION, WHICH CAN CAUSE EXCESSIVE CONTACT WEAR AND PRODUCE UNSATISFACTORY LIGHTNING PROTECTION.

(m) Connect electrical connector DT584 to oil quantity transmitter. (Ref. 70-00-00, P. Block 201).

(n) Install IDG harness, and clamp supports (13) with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(o) Install harness, clamps (8), (9), (11) and (12), clampshell (10), spacers, and attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(p) Install harness, clamp and attaching hardware on support brackets (5), (6) and (7).

(q) Install harness, clamp (3) and (4), with attaching hardware.

TORQUE nut to between 32 and 40 lbf.in. (0.37 and 0.40 m.daN).

(r)Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV214 to disconnect valve, and DT582 to oil temperature sensor. Tighten connector fingertight plus one-eighth turn. Wirelock connector. (Ref. Fig. 402).

(s)Install support bracket with ground studs 070001-00N and 070002-00N and attaching hardware on Flange H. TORQUE nuts to between 95 and 115 lbf.in. (1.08 and 1.29 m.daN).

(t)Install harness and clamps (1) and (2) with attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(u)Connect electrical connector DG13A and DG13B to IDG. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 401) (Sheet 2/2).

(v)Install DG13B branch of harness with clamp and attaching hardware to IDG oil outlet tube assembly. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(w)Connect power cables 070002-00N, 070003-00A, 070004-00B and 070005-00C to terminal block studs with nuts and washers. TORQUE nuts to between 144 and 168 lbf.in. (1.63 and 1.89 m.daN).

(x)Install terminal cover on IDG with screws and washers. Using lower IDG terminal block cover screw and clamp, attach DG13B branch of harness to terminal cover. TORQUE screw to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN).

(y)Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN). TORQUE harness attaching hardware bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(z)Install harness support (13), harness, clamps and attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

(3)Install wire harnesses 21W4070, 21W4072 and 21W4114 on left side of engine core (Post SB PWNAC 71-107) (Ref. Fig. 411).

(a)Position wire harness under pylon interface panel, remove protective covers from electrical plugs and receptacles for D4954, D4958 and D4961.

(b)Connect electrical plugs D4954, D4958 and D4961 to receptacles. Tighten connnector fingertight plus one-eighth turn. Wirelock connector.

(c)Install the IDG wire harness at pylon area as follows : (Ref. Fig. 414).

- Position the harness onto the pylon fire shield and secure with the nut.
  TORQUE nut to between 133 and 256 lbf.in. (1.5 and 2.9 m.daN).
- At pylon junction box, connect the wire 070003-00A to terminal block stud 1, wire 070004-00B to stud 2, wire 070005-00C to stud 3 and wire 070002-00N to stud 4 with nuts and washers.

TORQUE nuts to between 178 and 194 lbf.in. (2 and 2.2 m.daN). Install the terminal cover.

- Install the cover onto the junction box and secure with the screws (6), washers (7) and the screws (8) and the washers (9). TORQUE the screws (6) and (8) to between 21 and 23 lbf.in. (0.23 and 0.26 m.daN).
- Install the clamp (2) on grommet and attach the clamp with the bolt, the washer (4) and the nut (5) to bracket. TORQUE the nut to between 31 and 40 lbf.in. (0.35 and 0.45 m.daN).
- Install the clamp (15) on grommet, secure with the bolt (11), the washer (12) and the nut (13).
- Assemble the clamps (15) and (16) with the bolt (14) the washer (12) and the nut (13).
  TORQUE the two nuts to between 31 and 40 lbf.in. (0.35 and 0.45 m.daN).
- Install the two clamps (1) with screws and washers onto the bracket. TORQUE the screws to between 38 and 47 lbf.in. (0.42 and 0.54 m.daN).
- Seal the wires at the output of the junction box with Material No. 08-004 (Ref. 20-31-00, P. Block 1).
- Close the access doors 411DL, 411AZ, 413AL (Ref. 06-41-54, P. Block 1).

(d) Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN). (Ref. Fig. 411)

(e) Connect electrical connectors DV224A and DV224B to pneumatic regulator. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors.

(f) Remove nuts and washers from H29 high-stage temperature sensor terminals. Install terminal lugs, yellow on Post C and red on Post A with attaching hardware. TORQUE nuts : for Post C to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN) and for Post A to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(g) Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).

(h) Install harness, clamps (14) and (16), clampshell (15) and (17) and attaching hardware on tubing brackets. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(i) Install harness, clamps, and attaching hardware on support brackets (18) and (19). TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(j) Install harness, clamp supports (13), and attaching hardware to brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).

(k) Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve, and DT583 to oil pressure transmitter. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 403).

CAUTION : USE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR HARNESS CONNECTOR INSTALLATION (Ref. 70-00-00, P. BLOCK 201). USE OF INCORRECT ASSEMBLY PROCEDURE OR TOOLS, MAY DAMAGE OR LOOSEN CONNECTOR. LOOSE CONNECTORS PERMIT VIBRATION, WHICH CAN CAUSE EXCESSIVE

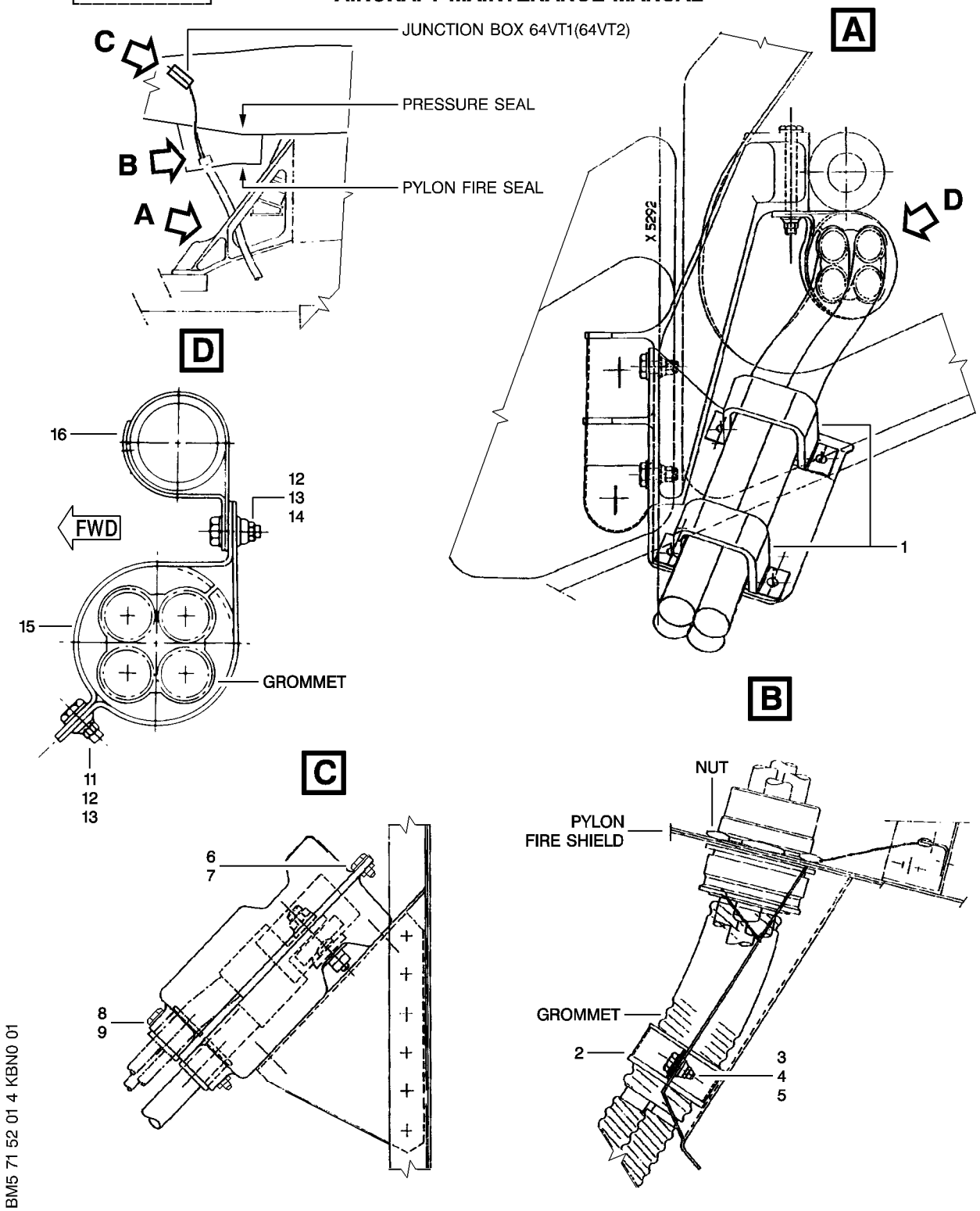
CONTACT WEAR AND PRODUCE UNSATISFACTORY LIGHTNING PROTECTION.

(l)Connect electrical connector DT584 to oil quantity transmitter. (Ref. 70-00-00, P. Block 201).
(m)Install IDG harness, and clamp supports (13) with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(n)Install harness, clamps (8), (9), (11) and (12), clampshell (10), spacers, and attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).
(o)Install harness, clamp and attaching hardware on support brackets (5), (6) and (7).
(p)Install harness, clamp (3) and (4), with attaching hardware. TORQUE nut to between 32 and 40 lbf.in. (0.37 and 0.40 m.daN).
(q)Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV214 to disconnect valve, and DT582 to oil temperature sensor. Tighten connector fingertight plus one-eighth turn. Wirelock connector. (Ref. Fig. 402).
(r)Install support bracket with ground studs 070001-00N and 070002-00N and attaching hardware on Flange H. TORQUE nuts to between 95 and 115 lbf.in. (1.08 and 1.29 m.daN).
(s)Install harness and clamps (1) and (2) with attaching hardware. TORQUE nuts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).
(t)Connect electrical connector DG13A and DG13B to IDG. Tighten connectors fingertight plus one-eighth turn. Wirelock connectors (Ref. Fig. 401) (Sheet 2/2).
(u)Install DG13B branch of harness with clamp and attaching hardware to IDG oil outlet tube assembly. TORQUE nut to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN).
(v)Connect power cables 070002-00N, 070003-00A, 070004-00B and 070005-00C to terminal block studs with nuts and washers. TORQUE nuts to between 144 and 168 lbf.in. (1.63 and 1.89 m.daN).
(w)Install terminal cover on IDG with screws and washers. Using lower IDG terminal block cover screw and clamp, attach DG13B branch of harness to terminal cover. TORQUE screw to between 20 and 22 lbf.in. (0.23 and 0.24 m.daN).
(x)Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN). TORQUE harness attaching hardware bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(y)Install harness support (13), harness, clamps and attaching hardware. nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

**ON A/C 101-200,

G. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers : 3WV2, 5WV, 6WV, 1KG, 2JH, 3XT, 1XT, 3HA, 9HA, 11HA, 99GK, 31GJ, 1EF, 1EL, 1EN, 1ES, 13ES, 3KC, 4XT, 2XT, 4HA, 10HA, 12HA, 100GK, 1GD, 2EF, 2EL, 2EN, 2ES, 14ES,



IDG Wire Harness
Figure 414

4KC.
(4)Remove access platform.

2. Removal/Installation of the Engine Core Harnesses (Post SB PW4NAC 71-151)

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	Corrosion Resistant Steel Lockwire (MS 20995C32) (Ref. 70-00-00)
D.	Torque Wrench
E.	Protective Covers
F. Material No. 08-004	Bonding and Adhesive Compounds (Ref. 20-31-00)
Referenced Procedures	
- 06-41-54, P. Block 1	Nacelles and Pylons (Power Plant Access Doors)
- 20-31-00, P. Block 1	List of Materials Required for Aircraft Service and Maintenance
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
21VU	ECAM/SDAC 26VAC REF2	3WV2	109/A02
21VU	ECAM/SDAC 26VAC REF3	5WV	109/A03
21VU	ECAM/SDAC SUPPLY	6WV	109/A05
133VU	ENGINES/ENG1 AND 2 START CTL AND WARN	1KG	335/R68
133VU	ENGINES/ENG1 AND 2 IGNITION SYST B	2JH	333/T72
For engine 1			
22VU	ELEC/DISC IDG1	3XT	206/D20
133VU	ELEC/GEN1 COOL VALVE	1XT	332/U80
131VU	AIR BLEED/ENG1 VALVES HP	3HA	311/H53
22VU	AIR BLEED/ENG1 WARN	9HA	203/G15
131VU	AIR BLEED/ENG1 VALVES BLEED	11HA	311/H54
133VU	HYDRAULIC/ENG1 PUMP CTL G	99GK	331/V58
133VU	HYDRAULIC/ENG1 PUMP CTL B	31GJ	331/V57
133VU	ENGINES/ENG1 OIL CLOG	1EF	331/V71
133VU	ENGINES/ENG1 FUEL FILTER	1EL	332/V72
133VU	ENGINES/OIL ENG1 QTY	1EN	336/Q68
133VU	ENGINES/OIL ENG1 LO PRESS	1ES	336/Q69
133VU	ENGINES/OIL ENG1 PRESS	13ES	336/Q70
133VU	ENGINES/ENG1 FUEL HP VALVE CTL	3KC	333/T69
For engine 2			
22VU	ELEC/DISC IDG2	4XT	206/D21
133VU	ELEC/GEN2 COOL VALVE	2XT	331/V80
131VU	AIR BLEED/ENG2 VALVES HP	4HA	312/G53
131VU	AIR BLEED/ENG2 WARN	10HA	312/G54

PANEL	SERVICE	IDENT.	LOCATION
131VU	AIR BLEED/ENG2 VALVES BLEED	12HA	311/H55
133VU	HYDRAULIC/ENG2 PUMP CTL G	100GK	332/U58
133VU	HYDRAULIC/ENG2 PUMP CTL Y	1GD	332/U57
133VU	ENGINES/ENG2 OIL CLOG	2EF	332/U73
133VU	ENGINES/ENG2 FUEL FILTER	2EL	332/U72
133VU	ENGINES/OIL ENG2 QTY	2EN	336/Q73
133VU	ENGINES/OIL ENG2 LO PRESS	2ES	336/Q72
133VU	ENGINES/OIL ENG2 PRESS	14ES	336/Q71
133VU	ENGINES/ENG2 FUEL HP VALVE CTL	4KC	333/T70

(2)Install access platform.
(3)Open fan cowl doors (Ref. 71-13-00, P. Block 301).

C. Removal
(1)Remove wire harness 21W4070 from left hand side of engine core.
(a)Remove terminal cover and attaching hardware from IDG.
(b)Remove nuts and washers attaching wires to IDG terminal studs and remove wires from studs.
(c)Remove nuts and washers attaching wire ground lugs to bracket and remove wires.
(d)Disconnect electrical connector D4955 from pylon generator wire harness receptacle.(Ref. Fig. 411)
(e)Open the clamps (five places) attaching the power harness to engine brackets.
(f)Remove the string ties connecting the two wires.
(g)Open the fairlead clamp attaching the power harness to the engine and remove the harness from the engine. Install protective covers.

**ON A/C 101-200,

Post SB 71-2017 For A/C 101-200,

C. Removal
(1)Remove wire harness 21W4070 from left hand side of engine core.
(a)Remove terminal cover and attaching hardware from IDG.
(b)Remove nuts and washers attaching wires to IDG terminal studs and remove wires from studs.
(c)Remove nuts and washers attaching wire ground lugs to bracket and remove wires.
(d)Remove the IDG wire harness from pylon area as follows :
(Ref. Fig. 414).
- Open the access doors 411DL (421DL), 411AZ (421AZ), 413AL (423AL) (Ref. 06-41-54, P. Block 1).
- Remove the bolt (11), the bolt (14), the washers (12) and nuts (13) attaching the half-clamps (15).
- Remove the bolt (3), the washer (4) and the nut (5) attaching the

clamp (2) to the bracket.
- Untighten the nut attaching the harness to pylon fire shield. Retain the nut.
- Remove the screws (6), washers (7) and the screws (8) and washers (9) to remove cover from the pylon junction box.
- Disconnect the wires 070003-00A, 070004-00B, 070005-00C and 070002-00N from the junction box.
- Remove the hardware attaching the two clamps (1) to bracket.

(e)Open the clamps (five places) attaching the power harness to engine brackets.
(f)Remove the string ties connecting the two wires.
(g)Open the fairlead clamp attaching the power harness to the engine and remove the harness from the engine. Install protective covers.

**ON A/C 101-200,

(2)Remove IDG control wire harness 21W4114 from left hand side of the engine core.
(Pre SB PWNAC 71-107). (Ref. Fig. 401) (Sheet 1/2).
(Post SB PWNAC 71-107). (Ref. Fig. 401) (Sheet 2/2).
(a)Disconnect connectors DG13A and DG13B from IDG. Install protective covers.
(b)Remove attaching hardware and clamp attaching harness to IDG oil outlet tube assembly.
(c)Remove IDG terminal cover screw and clamp attaching harness to terminal block cover.
(d)Remove attaching hardware and clamps attaching harness to support bracket.
(e)Disconnect electrical connector DV214 from disconnect valve, DT582 from oil temperature sensor, DS299 from oil filter differential pressure switch, and DS297 from low oil pressure switch. Install protective covers.(Ref. Fig. 410)
(f)Remove attaching hardware and clamps (1) and (2) attaching harnesses to brackets.
(g)Disconnect electrical connector DT583 from oil pressure transmitter. Install protective covers (Ref. Fig. 403).
(h)Remove attaching hardware and clamps (3) and (4) attaching harnesses to brackets.
(i)Remove attaching hardware and clamps (5, 6 and 7) attaching harnesses to brackets.
(j)Disconnect electrical connector DT584 from oil quantity transmitter. Install protective covers.
(k)Remove hardware and clamp (8) attaching harness to engine.
(l)Disconnect electrical connectors DV225A, DV225B, and DV225C from high pressure bleed control valve. Install protective covers.
(m)Remove attaching hardware, clamps (9), (11) and (12), and clampshell (10) attaching harness to engine.
(n)Disconnect electrical connectors DV224A and DV224B from pneumatic regulator. Install protective covers. (Ref. Fig. 411)
(o)Remove attaching hardware, clamp (14), and clampshell (15) attaching hardware to tubing bracket.

(p)Disconnect electrical connector D4961 from pylon generator wire harness receptacle. Install protective covers.
(q)Remove nuts, washers and contacts from H29 high-stage temperature sensor terminals. Remove lugs and reinstall hardware.
(r)Remove attaching hardware, clamps (16), and clampshells (17) attaching hardware to tubing brackets.
(s)Remove attaching hardware and clamps attaching electrical harness to support brackets (18) and (19) on 2.9 bleed valve flange.
(t)Remove attaching hardware and clamp (20) attaching harness to engine bracket.
(u)Disconnect electrical plugs D4954 and D4958 from pylon interface panel receptacles. Install protective covers.
(v)Remove wire harness 21W4114 from engine.

(3)Remove core miscellaneous wire harness 21W4072 from right hand side of engine core.
(a)Disconnect connector DT579 from No. 3 bearing oil temperature sensor and electrical connector DV215 from starter shutoff valve. Install protective covers. (Ref. Fig. 412)
(b)Remove attaching hardware and clamp (1) attaching harness to starter shutoff valve cover.
(c)Remove attaching hardware and clamps attaching harness to support brackets, drain filters support bracket, and bracket on Flange M.
(d)Disconnect connector DV213 from hydraulic pump. Install protective covers.
(e)Remove attaching hardware and clamps (2) and (3) attaching harness to support bracket and hydraulic pump.
(f)Remove attaching hardware and clamps (4) and (6) attaching harness to stator vane actuator support bracket and clamps (5) and (7) attaching harness to tube support brackets (Ref. Fig. 406).
(g)Disconnect electrical connector DV216 from IDG AOC valve. Install protective covers.
(h)Disconnect connector DT581 from fuel pressure transmitter and electrical connector DT595 from core compartment temperature sensor. Install protective covers (Ref. Fig. 407).
(i)Remove attaching hardware and clamps (9) and (10) attaching harness to fuel pressure transmitter support bracket and tube support bracket.
(j)Disconnect connector DH10 from fuel condition actuator. Install protective covers.
(k)Remove attaching hardware, clamps (11), (13) and (15), and clamp shell (14) attaching harness to tube support brackets and clamp (12) attaching harness to fuel condition actuator support bracket.
(l)Disconnect connector D4991 from fuel pump and connector DT580 from fuel pump and connector DT580 from fuel flow transmitter. Install protective covers.
(m)Remove attaching hardware and clamps (16) and (17) attaching harness to fuel flow transmitter support bracket.
(n)Remove attaching hardware and clamp (18) attaching harness to drain filters support bracket and support bracket (Ref. Fig. 408).
(o)Disconnect electrical connector DH8 from igniter exciter and electrical connector DH7 from engine exciter. Install protective covers.

(p)Remove attaching hardware and clamps (19) and (20) attaching harness to brackets ; and clamps attaching harness to brackets (21), (22) and (23).
(q)Remove attaching hardware and clamps attaching electrical harness to support brackets (24), (25) and (27) (Ref. Fig. 409).
(r)Remove ground connection support bracket with ground connections attached.
(s)Remove attaching hardware, clamps (26), (27) and (28) and clamp shells (27) attaching harness to existing brackets.
(t)Disconnect electrical plug DS298 from IDG AOC pressure switch. Install protective covers.
(u)Disconnect electrical plugs D4952, D4956 and D4961 from pylon interface panel receptacles. Install protective covers.
(v)Remove wire harness 21W4072 from right side of engine.

D. Installation
(1)Install wire harness 21W4070 on left side of engine core.
(a)Connect the IDG power harness to the connector at the pylon. The connector should be fingertight plus one-eighth turn. (Ref. Fig. 415)
(b)Install the harness into the upper quick release clamp using the installation reference marker on the harness for location. Close the clamp.
(c)At base of pylon interface panel, remove protective covers from IDG electrical plug D4955 and receptacle for pylon generator wire harness. (Ref. Fig. 411)
(d)Connect IDG wire harness 21W4114, electrical plug D4955 to pylon generator wire harness receptacle and tighten plug fingertight plus one-eight turn. Lockwire plug.
(e)Route the harness down to the IDG closing the quick release clamps as required. See (Ref. Fig. 415) for correct orientation of harness into clamps.
(f)Attach the ground lugs to engine bracket using bolt, washer and nut. TORQUE the bolts to between 160 and 190 lbf.in. (1.81 and 2.15 m.daN).
(g)Perform an electrical bonding check from the IDG ground lugs to the engine Flange H. The reading must be less than 0.0025 ohms.
(h)Install the harness assembly into the fairlead clamp and attach bracket with 21W4114 harness onto clamp using two bolts and two washers. TORQUE the bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(i)Install a string tie to secure the ground wires together.
(j)Position the IDG harness wires to the IDG studs using nuts and washers. TORQUE the nuts to between 144 and 168 lbf.in. (1.63 and 1.9 m.daN). See (Ref. Fig. 415) for correct location of the IDG power wires to the studs.
(k)Position terminal cover onto IDG terminal block and secure using washer and screws (two places). TORQUE the screws to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

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Post SB 71-2017 For A/C 101-200,

D. Installation

(1)Install wire harness 21W4070 on left side of engine core.

(a)Connect the IDG power harness to the connector at the pylon. The connector should be fingertight plus one-eighth turn. (Ref. Fig. 415)

(b)Install the harness into the upper quick release clamp using the installation reference marker on the harness for location. Close the clamp.

(c)Install the IDG wire harness at pylon area as follows : (Ref. Fig. 414).

- Position the harness onto the pylon fire shield and secure with the nut.
  TORQUE nut to between 133 and 256 lbf.in. (1.5 and 2.9 m.daN).
- At pylon junction box, connect the wire 070003-00A to terminal block stud 1, wire 070004-00B to stud 2, wire 070005-00C to stud 3 and wire 070002-00N to stud 4 with nuts and washers.
  TORQUE nuts to between 178 and 194 lbf.in (2 and 2.2 m.daN). Install the terminal cover.
- Install the cover onto the junction box and secure with the screws (6), washers (7) and the screws (8) and the washers (9). TORQUE the screws (6) and (8) to between 21 and 23 lbf.in. (0.23 and 0.26 m.daN).
- Install the clamp (2) on grommet and attach the clamp with the bolt, the washer (4) and the nut (5) to bracket. TORQUE the nut to between 31 and 40 lbf.in. (0.35 and 0.45 m.daN).
- Install the clamp (15) on grommet, secure with the bolt (11), the washers (12) and the nut (13).
- Assemble the clamps (15) and (16) with the bolt (14) the washer (12) and the nut (13).
  TORQUE the two nuts to between 31 and 40 lbf.in. (0.35 and 0.45 m.daN).
- Install the two clamps (1) with screws and washers onto the bracket. TORQUE the screws to between 38 and 47 lbf.in. (0.42 and 0.54 m.daN).
- Seal the wires at the output of the junction box with Material No. 08-004 (Ref. 20-31-00, P. Block 1).
- Close the access doors 411DL (421DL), 411AZ (421AZ), 413AL (423AL) (Ref. 06-41-54, P. Block 1).

(d)Route the harness down to the IDG closing the quick release clamps as required. See (Ref. Fig. 415) for correct orientation of harness into clamps.

(e)Attach the ground lugs to engine bracket using bolt, washer and nut. TORQUE the bolts to between 160 and 190 lbf.in. (1.81 and 2.15 m.daN).

(f)Perform an electrical bonding check from the IDG ground lugs to the engine Flange H. The reading must be less than 0.0025 ohms.

(g)Install the harness assembly into the fairlead clamp and attach bracket with 21W4114 harness onto clamp using two bolts and two washers. TORQUE the bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(h)Install a string tie to secure the ground wires together.

(i)Position the IDG harness wires to the IDG studs using nuts and washers. TORQUE the nuts to between 144 and 168 lbf.in. (1.63 and 1.9 m.daN). See (Ref. Fig. 415) for correct location of the IDG power wires to the studs.

(j)Position terminal cover onto IDG terminal block and secure using washer and screws (two places). TORQUE the screws to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

**ON A/C 101-200,

(2)Install the IDG wire harness 21W4114 on the left side of the engine core.
(a)Position wire harness under pylon interface panel, remove protective covers from electrical plugs and receptacles for D4954, D4958 and D4961.
NOTE : All connectors/plugs should be tightened to fingertight plus one-eighth turn.
(b)Connect electrical plugs D4954, D4958 and D4961 to receptacles. Lockwire connectors. (Ref. Fig. 411)
(c)Install clamp (20) on existing bracket with attaching hardware. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(d)Connect electrical connectors DV224A and DV224B to pneumatic regulator. Lockwire connectors.
(e)Remove nuts and washers from H29 high-stage temperature sensor terminals.
Install terminal lugs, yellow on Post C and red on post A, with attaching hardware. TORQUE nuts : for Post C to between 20 and 22 lbf.in. (0.23 and 0.25 m.daN) and for Post A to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).
(f)Install ground cables support bracket on engine core access cover with attaching hardware. TORQUE bolts to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN).
(g)Install harness, clamps (14) and (16), clamp shells (15) and (17) and attaching hardware on tubing brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(h)Install harness, clamps, and attaching hardware on support brackets (18) and (19).
TORQUE nuts to between 32 and 36 lbf. in. (0.36 and 0.41 m.daN).
(i)Connect electrical connectors DV225A, DV225B, and DV225C to high pressure bleed control valve and DT583 to oil pressure transmitter Lockwire connectors. (Ref. Fig. 403)
(j)Connect electrical connector DT584 to oil quantity transmitter. Lockwire connector.
(k)Install harness, clamps (8), (9), (11) and (12), clamp shell (10), spacers, and attaching hardware.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(l)Install harness, clamps and attaching hardware on support brackets (5), (6) and (7).
(m)Install harness, and clamps (3) and (4), with attaching hardware.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(n)Connect electrical connector DS297 to low oil pressure switch, DS299 to oil filter differential pressure switch, DV214 to disconnect valve, and DT582 to oil temperature sensor. Lockwire connectors. (Ref. Fig. 410).
(o)Install harness and clamps (1) and (2) with attaching hardware. TORQUE

nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(p) Connect electrical connectors DG13A and DG13B to IDG. Lockwire connectors. (Ref. Fig. 401)

(q) Install DG13B branch of harness with clamp to IDG oil outlet tube. (Post SB PW4NAC 71-070 and PW4NAC 71-107) (Ref. Fig. 401) (Sheet 2/2).

(r) Install harness support rail with attaching hardware. TORQUE nuts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(s) Install DG13B branch of harness to support rail with clamps. (Pre SB PW4NAC 71-070 and PW4NAC 71-107) (Ref. Fig. 401) (Sheet 1/2).

(t) Install support bracket with cable guide bracket, clamps and attaching hardware. TORQUE bracket bolts and attaching hardware bolts to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(3) Install wire harness 21W4072 on right hand side of engine core.

CAUTION : USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (REF. 70-00-00, P. BLOCK 201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAN CAUSE THE CONTACTS TO WEAR AND UNSATISFACTORY LIGHTNING PROTECTION.

(a) Position wire harness 21W4072 under pylon interface panel, remove protective covers ; connect D4952 and D4956 to receptacles. Lockwire connectors. (Ref. Fig. 409)

NOTE : All connectors should be tightened fingertight plus one-eighth turn.

(b) Install harness, clamp (28), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(c) Connect electrical connector DS298 to IDG AOC pressure switch. Lockwire connector.

(d) Install harness, clamps (26) and (28), attaching hardware on brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(e) Install harness, clamps, and attaching hardware on support brackets (24), (25) and (27). TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(f) Connect electrical connector DH7 to engine igniter and DH8 to igniter exciter. Lockwire connectors. (Ref. Fig. 408)

(g) Install harness, clamps, and attaching hardware on support bracket, support bracket (21), (22) and (23), and drain support bracket filter. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(h) Install harness, clamps (18), (19) and (20), and attaching hardware on support brackets. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(i) Connect electrical connectors DT580 to fuel flow transmitter, D4991 to fuel pump, DT595 to core compartment temperature sensor, and DT581 to fuel pressure transmitter. Lockwire connectors. (Ref. Fig. 407)

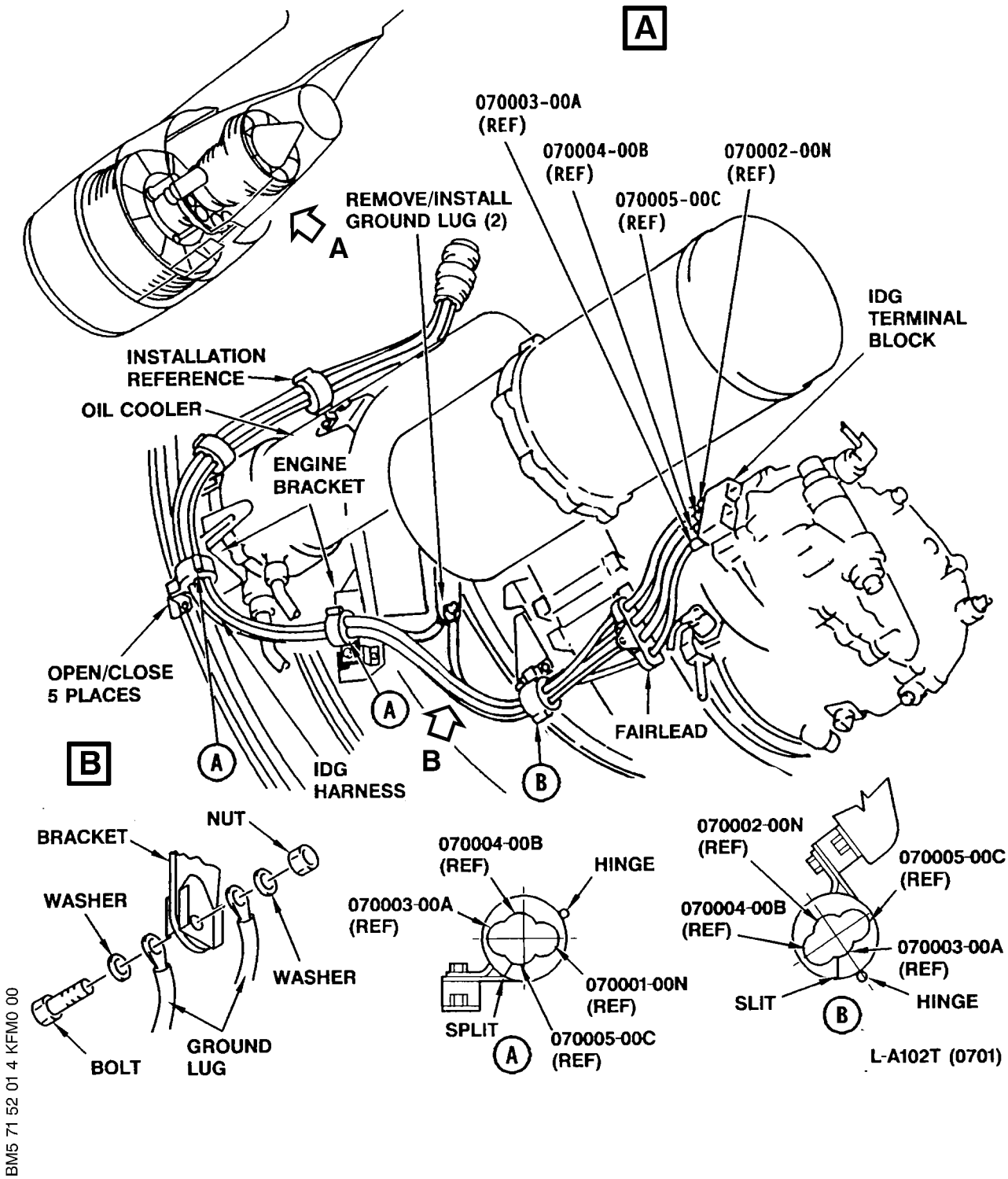
(j) Connect electrical connector DH10 to the fuel condition actuator or FMU. Lockwire connector.

(K) Install harness, clamp (17) and attaching hardware on support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(l) Install harness, clamp (16) and attaching hardware on fuel flow transmitter bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(m)Install harness, clamps (15), (13), (11) and (10), clamp shell (14), and attaching hardware on tube support bracket. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(n)Install harness, clamp (12) and attaching hardware on fuel condition actuator support bracket.
TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(o)Install clamp (9) with attaching hardware on fuel pressure transmitter support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(p)Connect electrical connector DV216 to IDG AOC valve. Lockwire connector (Ref. Fig. 406)
(q)Install harness, clamps (6) and (4), clamp shell (7), and attaching hardware on tube support brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(r)Install harness clamps (5) and (8), and attaching hardware on stator vane actuator support brackets.
TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(s)Connect electrical connectors DV215 to starter shutoff valve, DT579 to No. 3 bearing oil temperature sensor, and DV213 to hydraulic pump. Lockwire connectors. (Ref. Fig. 412)
(t)Install harness, clamp (3), and attaching hardware on bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(u)Install harness, clamp (2), and attaching hardware on hydraulic pump support bracket. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(v)Install harness, clamps, and attaching hardware on support bracket, and drain filter support bracket. TORQUE nuts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).
(w)Install harness, clamp (1) and attaching hardware on shutoff valve cover. TORQUE nut to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers : 3WV2, 5WV, 6WV, 1KG, 2JH, 3XT, 1XT, 3HA, 9HA, 11HA, 99GK, 31GJ, 1EF, 1EL, 1EN, 1ES, 13ES, 3KC, 4XT, 2XT, 4HA, 10HA, 12HA, 100GK, 1GD, 2EF, 2EL, 2EN, 2ES, 14ES, 4KC.
(4)Remove access platform.



IDG Power Wire Harness
Figure 415

ENGINE DRAINS - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

A. The Pod assembly drain and vent installation consists of provisions for collecting and carrying leaked fluids and vapors overboard from the engine, accessories, nacelle and pylon cavities. Both operational and service drains are provided ; the operational and service drains are always open to drain away fluids that might accumulate. Some operational drains also act as small vents for the compartments they service. Provisions for drains are built into both engine and nacelle components.

B. The engine drain system provides a discharge path to prevent spilled fluids from draining over a hot engine and a method for determining the condition of equipment seals. It is divided into four separate discharge lines and one drip pan assembly. Test cap fittings and a common collector box provide a method to determine which of 17 drains are leaking.
The four discharge lines are the pylon drain, the hydraulic pumps drain, the manifold collector drain and the cooler/actuator drain.

2. Function

Drains are provided from the nacelle, pylon, engine accessories and engine to carry fluids from any point where lines and accessories may leak and where fluids may accumulate in a cavity. The drain lines connect to outlets that discharge the fluids overboard.
Small drain openings are provided in the cowl structure for each nacelle compartment. Bottom segments of acoustic panels in the fan duct outer surface incorporate drainage provisions to prevent water accumulation after shutdown.

3. Operational and Service Drains

Drain lines from operational and service drain ports are piped overboard and service the following :
- Pylon, pylon junction boxes, engine core compartment, and engine oil tank scupper.
- All accessory gearbox drive pad seal drains, and all seal drains of engine accessories (fuel/oil heat exchanger, stator vane actuator, and 2.5 bleed valve actuator).

R 4. Pylon Drain (Ref. Fig. 002)

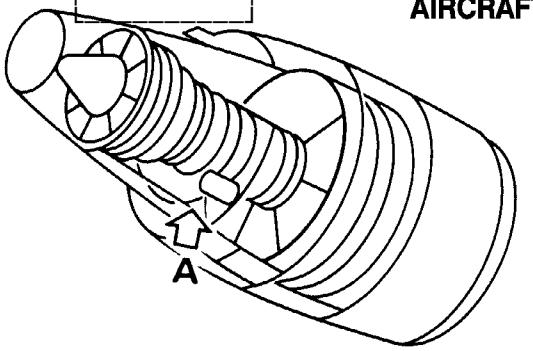
The pylon drain includes the following.

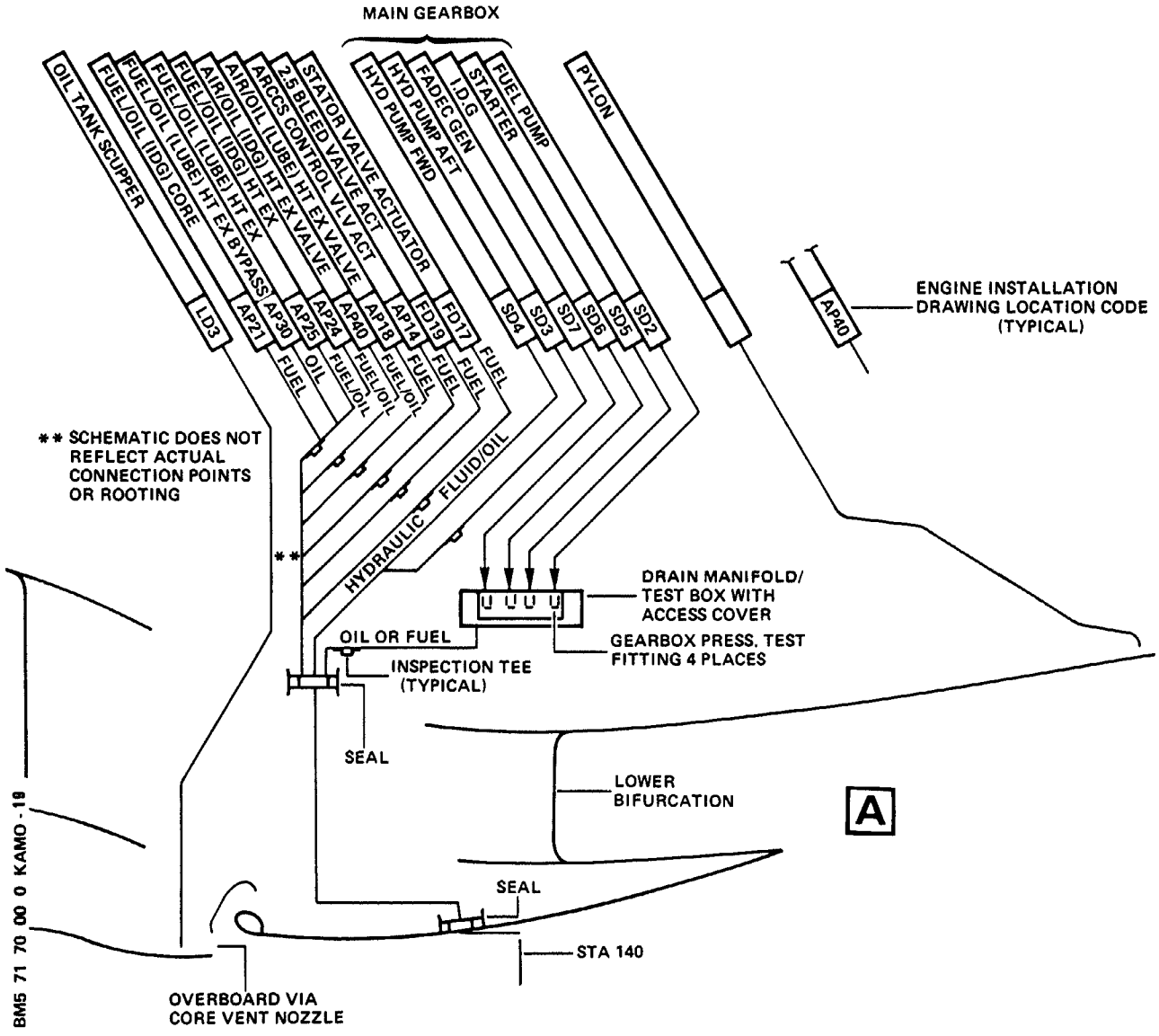
A. The pylon drain that carries hydraulic fluid and engine fuel from the pylon.

B. The oil tank scupper drain that drains engine oil spilled from the oil overflow pressure adapter or from a gravity fill of the oil tank.

5. Hydraulic Pumps Drain (Ref. Fig. 003)

A. The hydraulic pumps drain line includes the left-hand and the right-hand hydraulic pumps and provides an indication of seal conditions in either pump.





Drains System
Figure 001

B. Inspection of the hydraulic pumps line to determine whether the seals on the left-hand or right-hand pump are deteriorating is performed by observing a discharge from the hydraulic pumps discharge line and then removing the test cap, near the left-hand pump, on drain line. If this cap is full of fluid, the left-hand pump has deteriorating seals. If this cap is empty, the seals on the right-hand pump are deteriorating.

6. Manifold Collector Drain (Ref. Fig. 004)

A. The manifold collector drain provides an indication of seal conditions for the pneumatic starter, the fuel pump, the Full Authority Digital Engine Control (FADEC) alternator and the integrated drive generator (IDG).

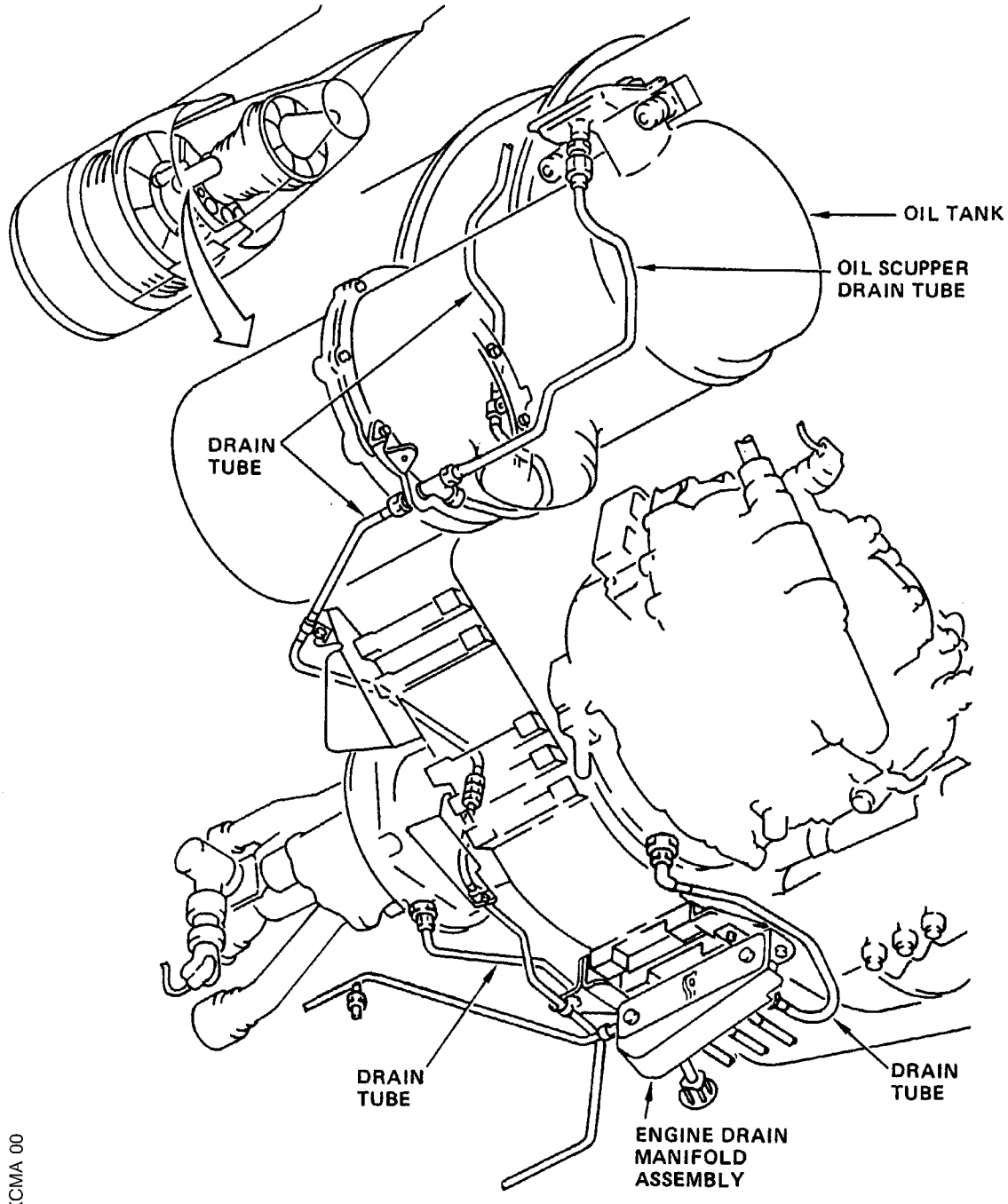
B. Inspection of the fuel pump, FADEC alternator, starter, and integrated drive generator (IDG) individual drain lines is performed by removing the inspection cover plate on the drain manifold collector and observing which line is discharging fluid. This line can be identified by matching the line with the name stamped on the cover plate or by visual identification of the equipment.

7. Cooler/Actuator Drain (Ref. Fig. 005, 006)

A. The cooler/actuator drain line provides an indication of seal conditions for the following.
(1)The fuel/oil cooler, rear fuel section at port AP25.
(2)The fuel/oil cooler front fuel section at port AP24.
(3)The fuel/oil cooler bypass valve oil section at port AP30.
(4)The fuel/oil cooler IDGS core fuel section at port AP21.
(5)The bleed actuator.
(6)The engine air/oil heat exchanger.
(7)The IDG air/oil heat exchanger.
(8)The turbine case cooling (TCC) actuator drain.
(9)The engine vane bellcrank actuator.

B. Inspection of the cooler/actuator drain line to isolate individual equipment is performed as follows :
(1)Verify that fluid is leaking from the cooler/actuator drain line.
(2)Select one of the three general input branches : the bleed actuator branch, the fuel/oil cooler branch, or the TCC actuator branch.
(3)Fluid in a test cap will indicate which general branch to test next.
(4)Continue the process of elimination until the individual equipment is identified.
Pylon, Oil Tank Scupper And IDG Drain Tubes.

8. Drip Pan Tube Assembly (Ref. Fig. 007)
The drip pan tube assembly drains hydraulic fluid and engine fuel from the disconnect panel installed at the top, right-hand side of the nacelle.



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Pylon, Oil Tank Scupper, and IDG Drain Tubes (Sheet 1)
Pre SB PW4NAC 71-92
Figure 002

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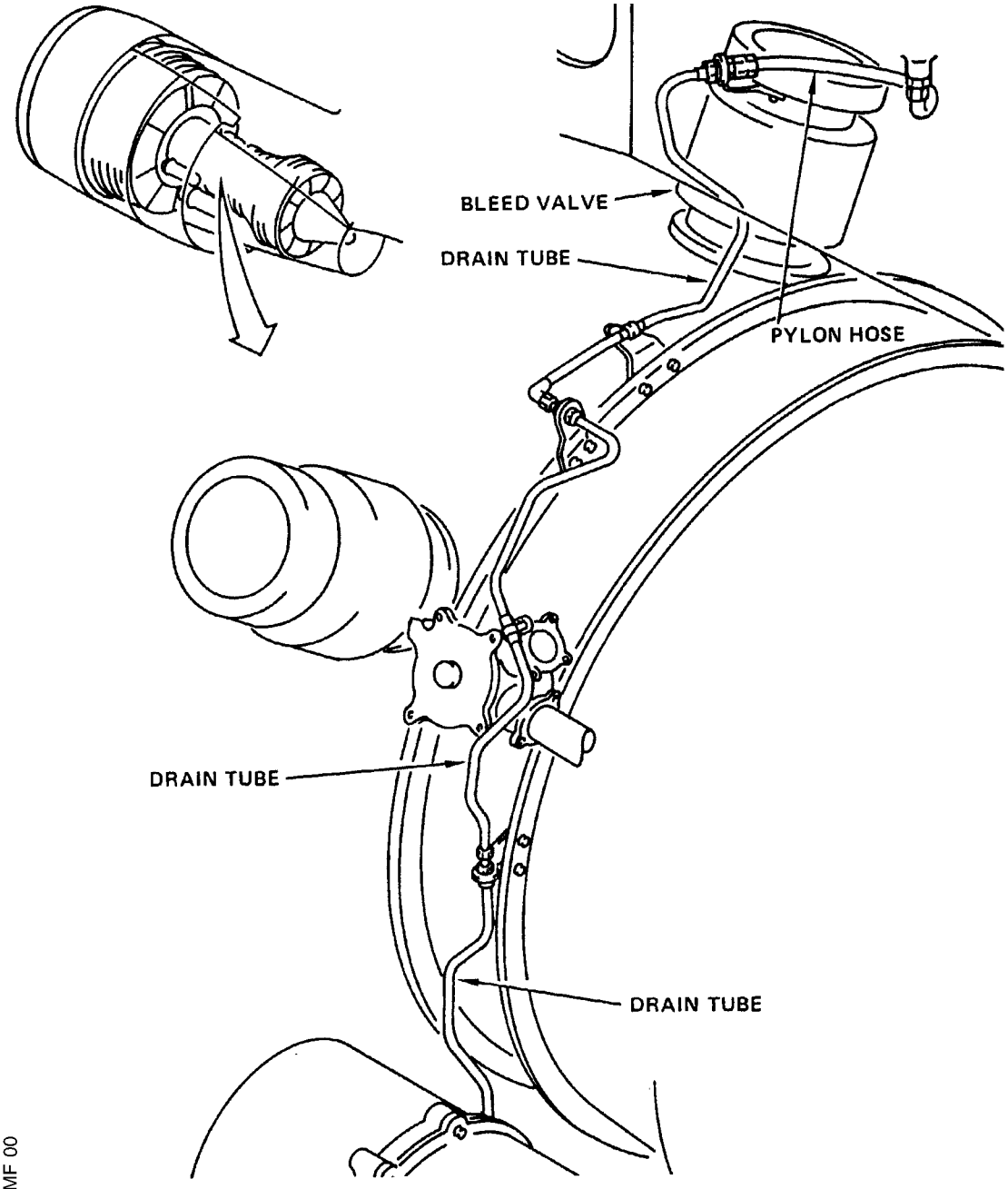

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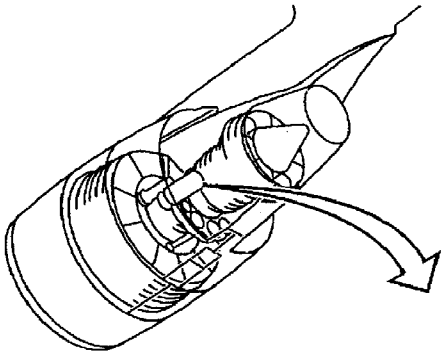
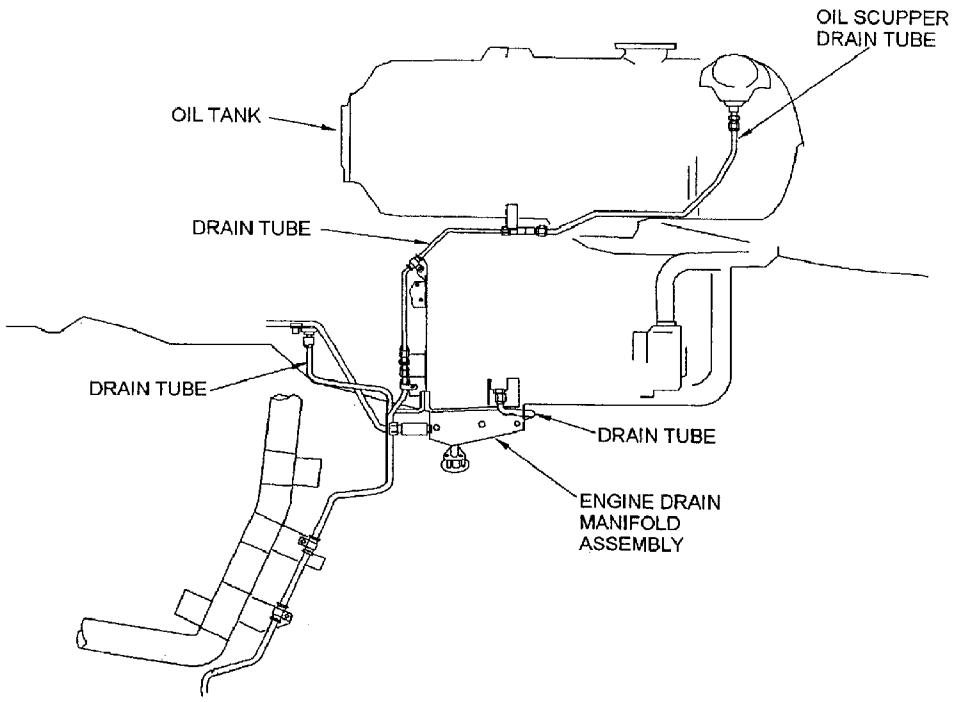
Pylon, Oil Tank Scupper, and IDG Drain Tubes (Sheet 2)
Pre SB PW4NAC 71-92
Figure 002

R





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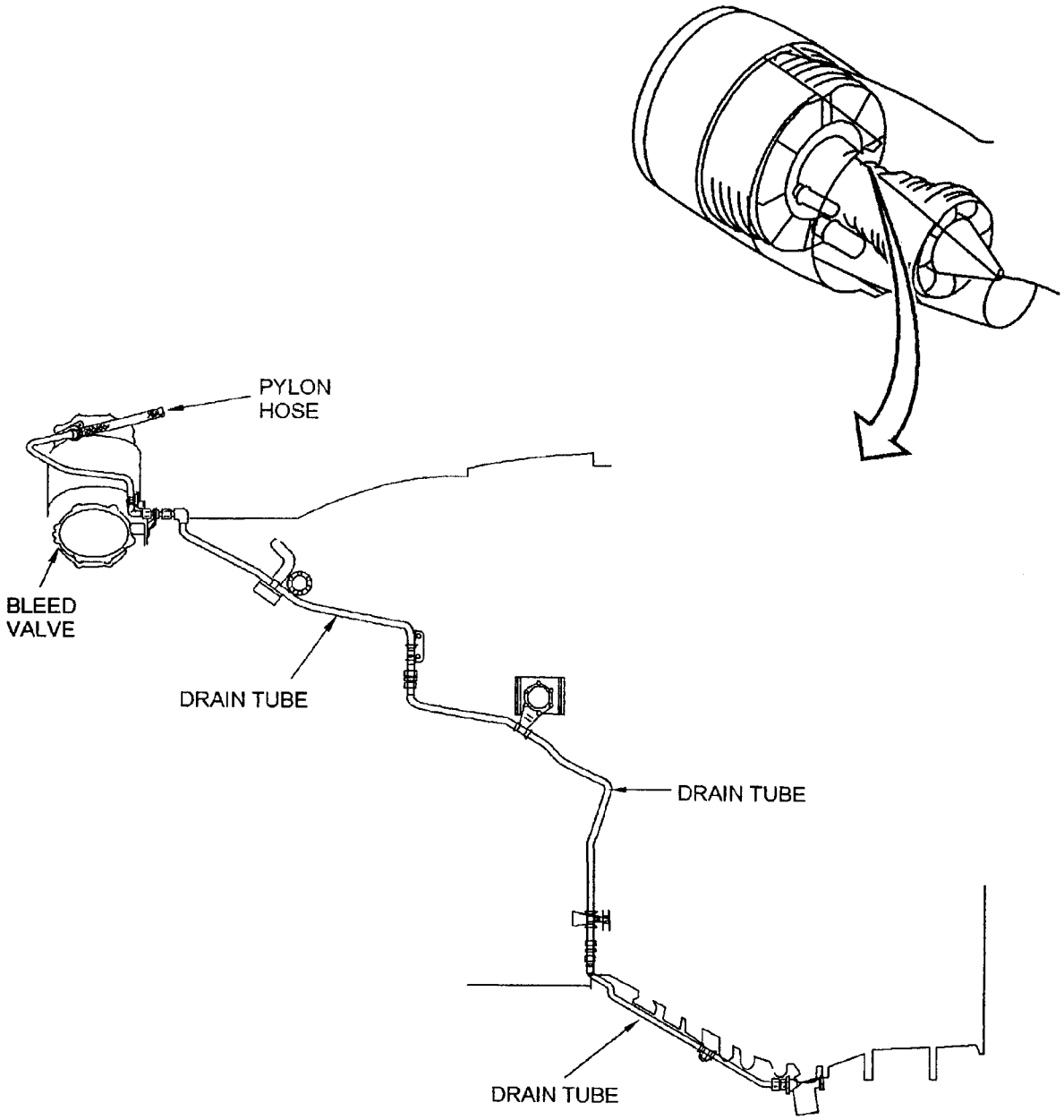
Pylon, Oil Tank Scupper, and IDG Drain Tubes (Sheet 3)
Post SB PW4NAC 71-92
Figure 002

R



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Pylon, Oil Tank Scupper, and IDG Drain Tubes (Sheet 4)
Post SB PW4NAC 71-92
Figure 002

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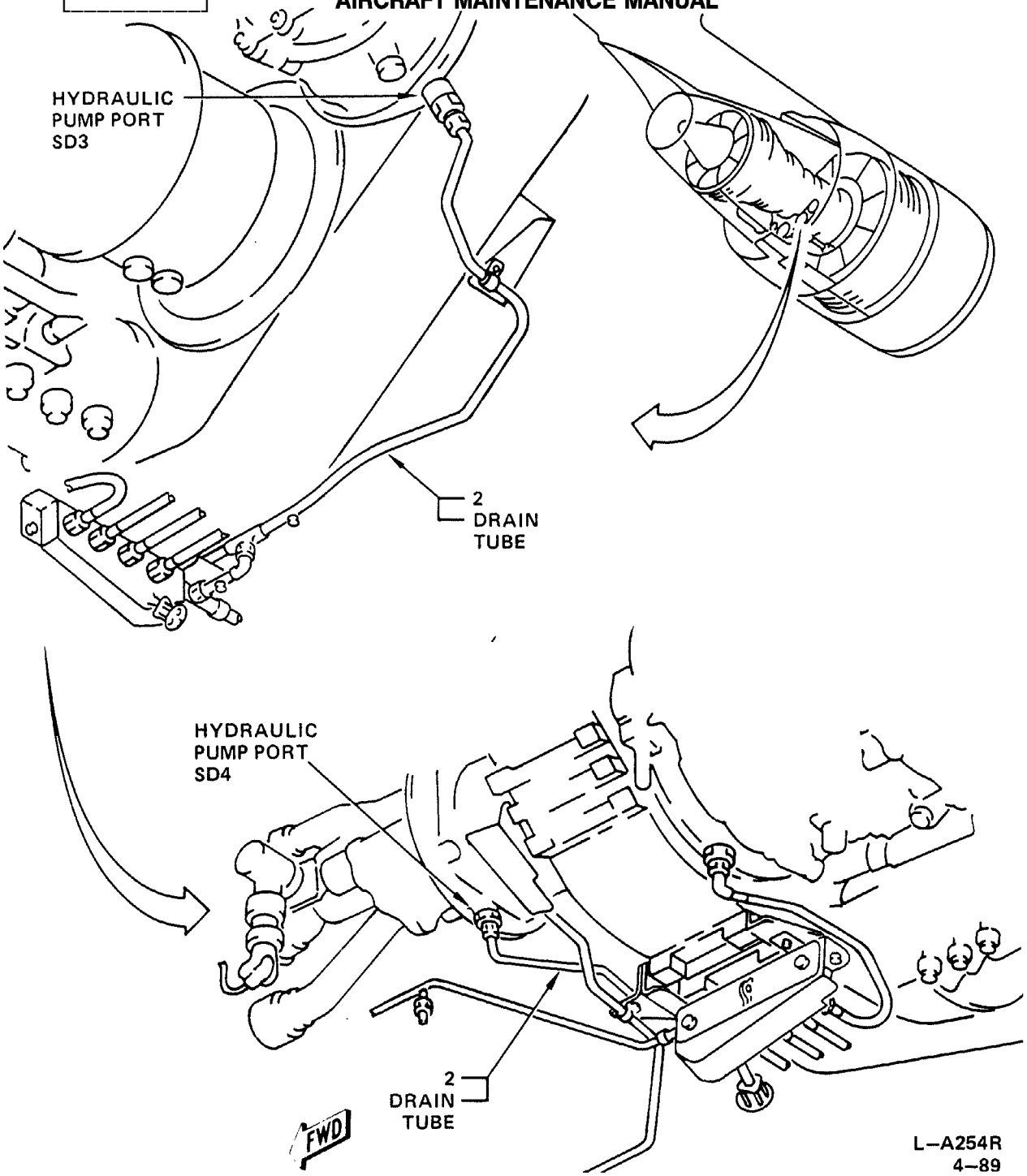

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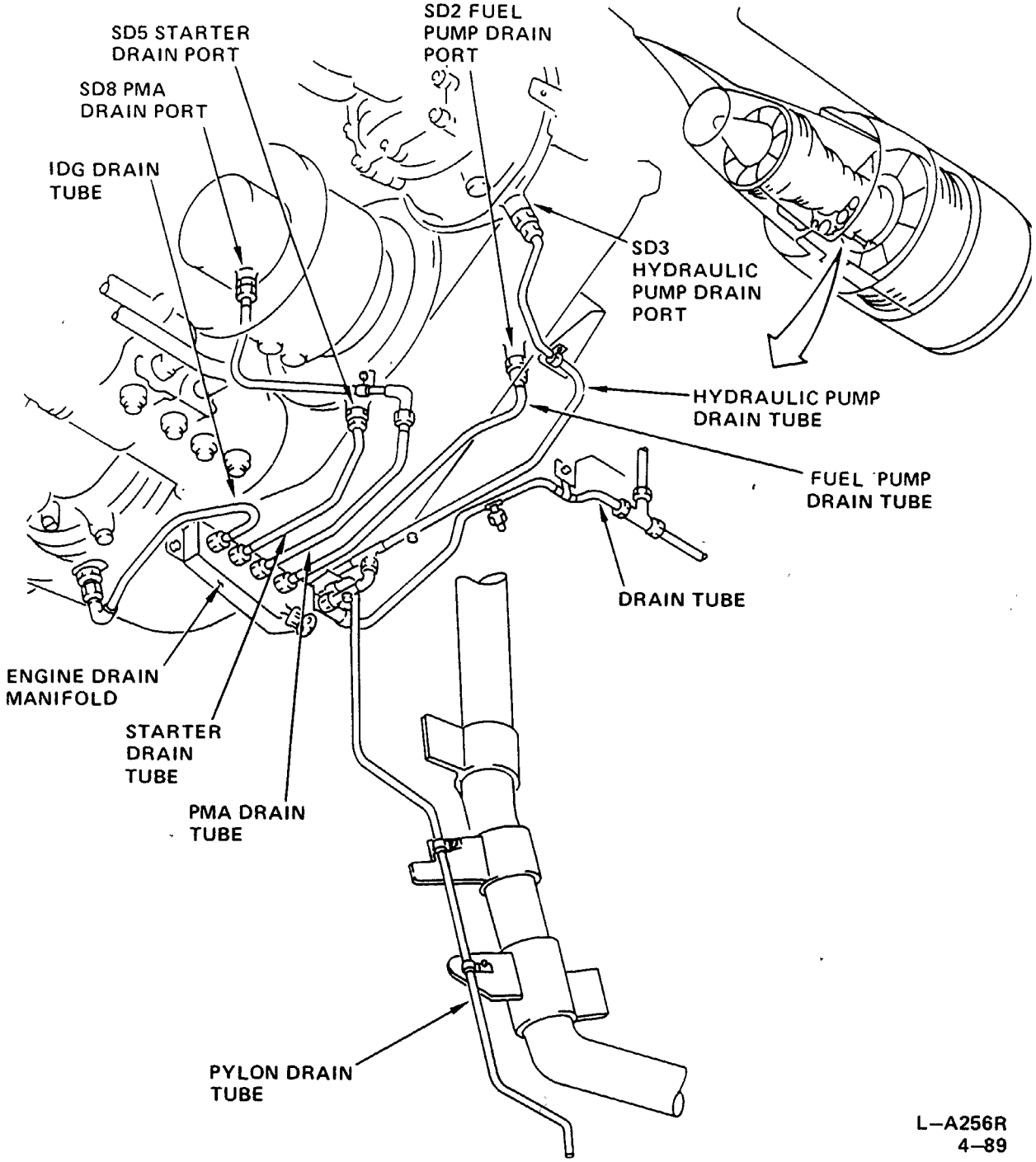
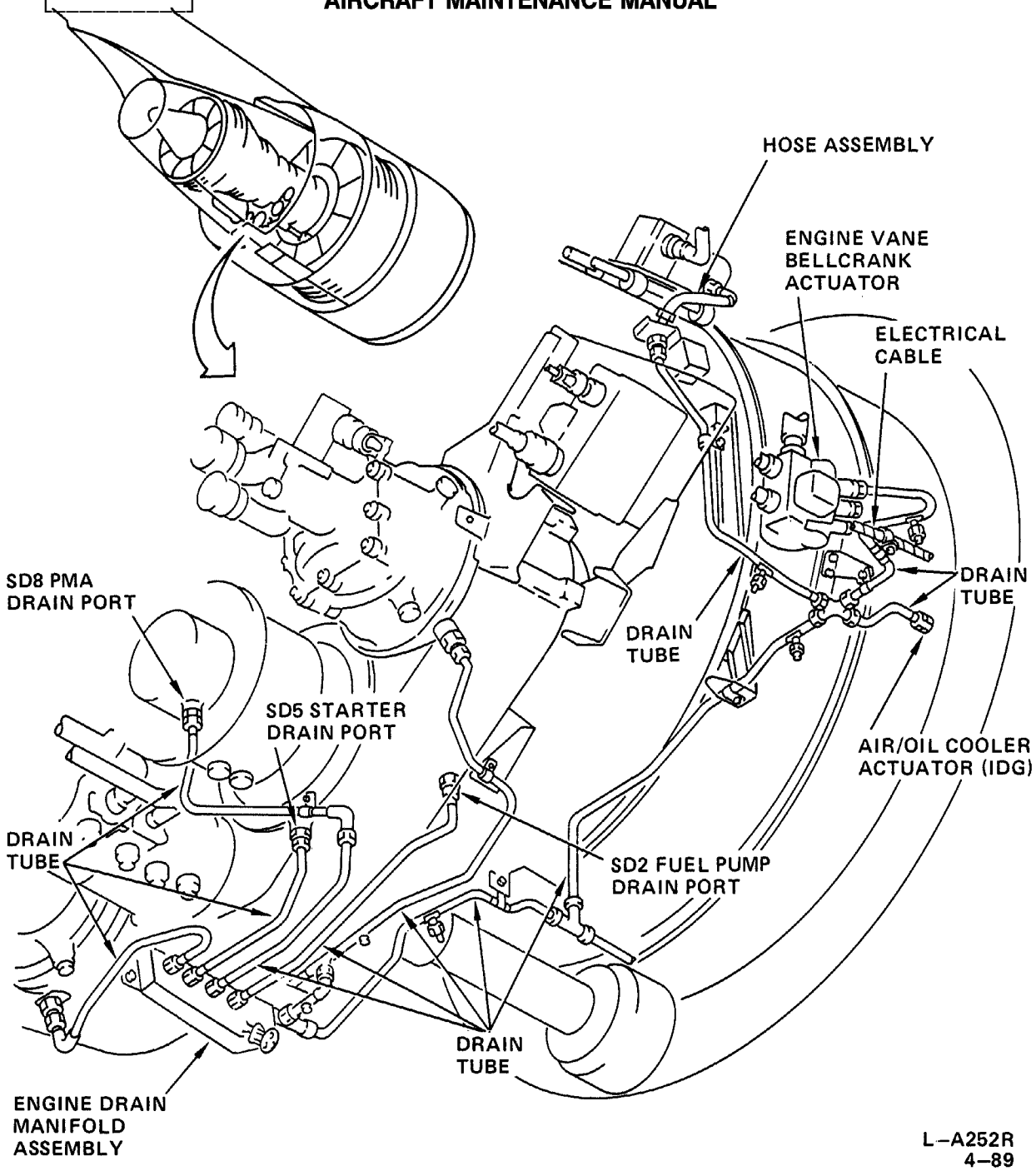
Hydraulic Pumps Drain Tubes
Figure 003



Engine Drain Manifold
Figure 004



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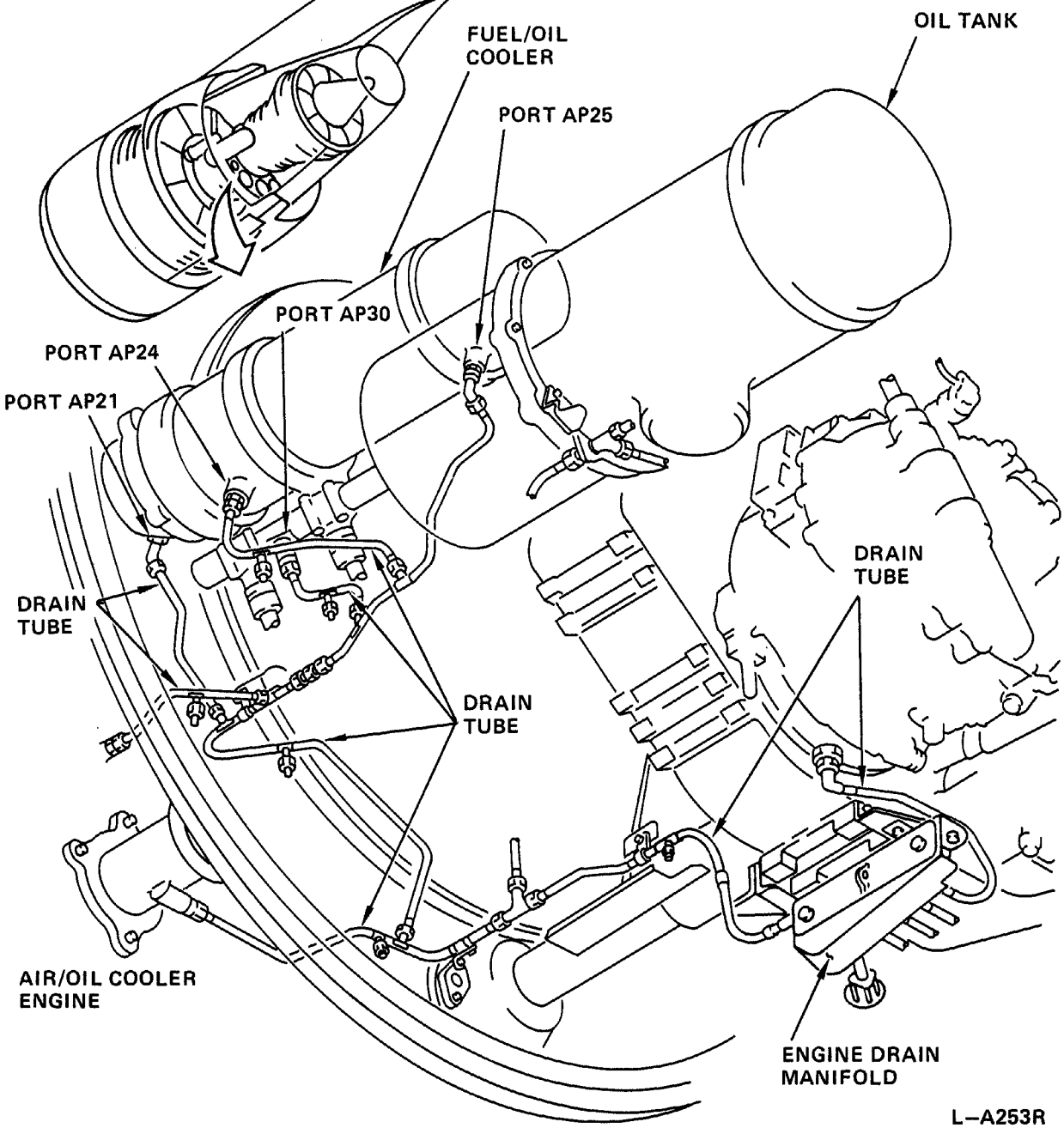
Cooler/Actuator Drain Tubes
Figure 005



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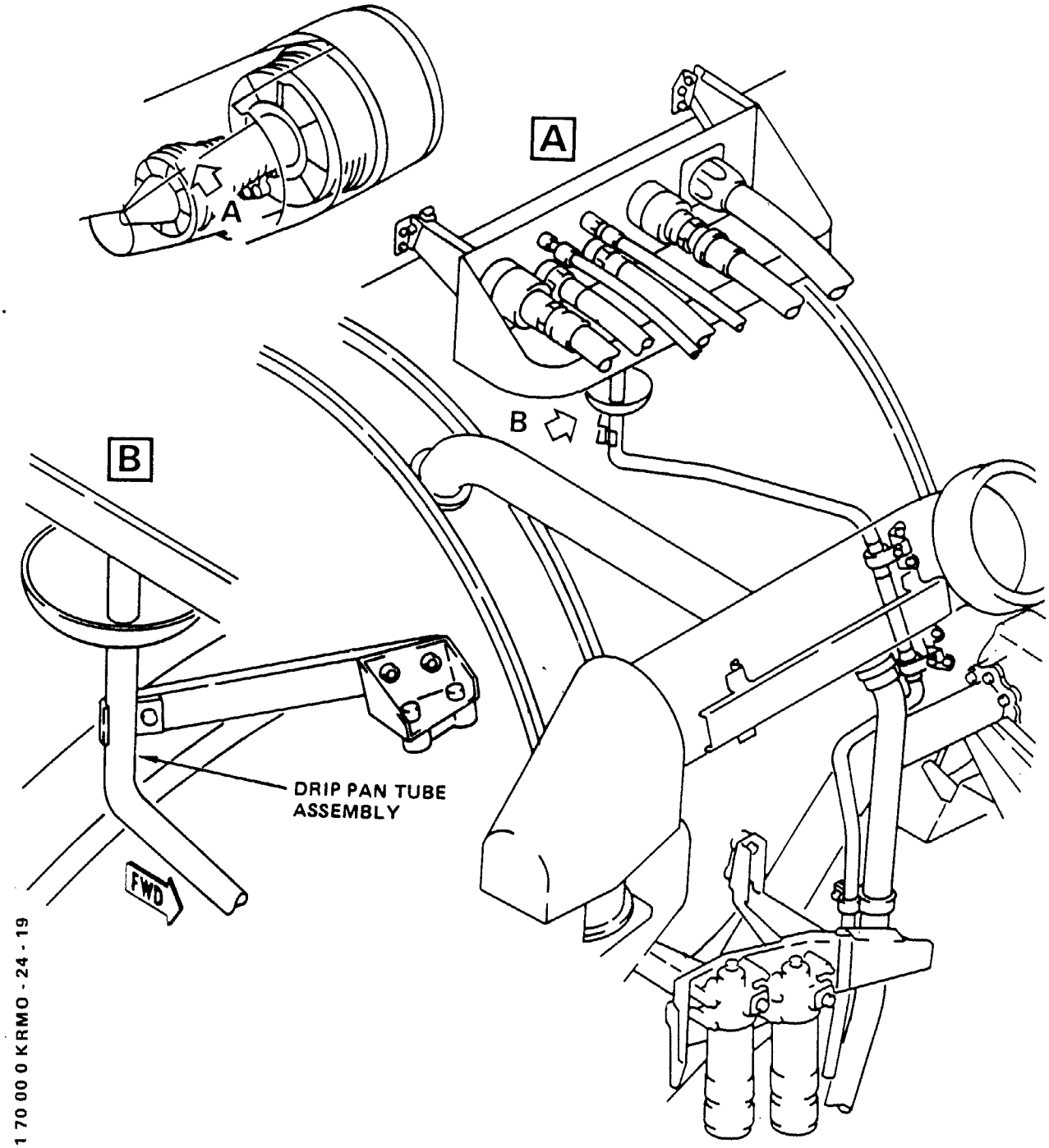
Cooler/Actuator Drain Tubes
Figure 006



Drip Pan Tube Assembly
Figure 007

DRAIN MANIFOLD ASSEMBLY - REMOVAL/INSTALLATION

R 1. Equipment and Materials

ITEM	DESIGNATION
A.	Access Platform
B.	Circuit Breaker Safety Clips
C.	Torque Wrench
D.	Container, 2US gal (7.2l)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

R 2. Procedure

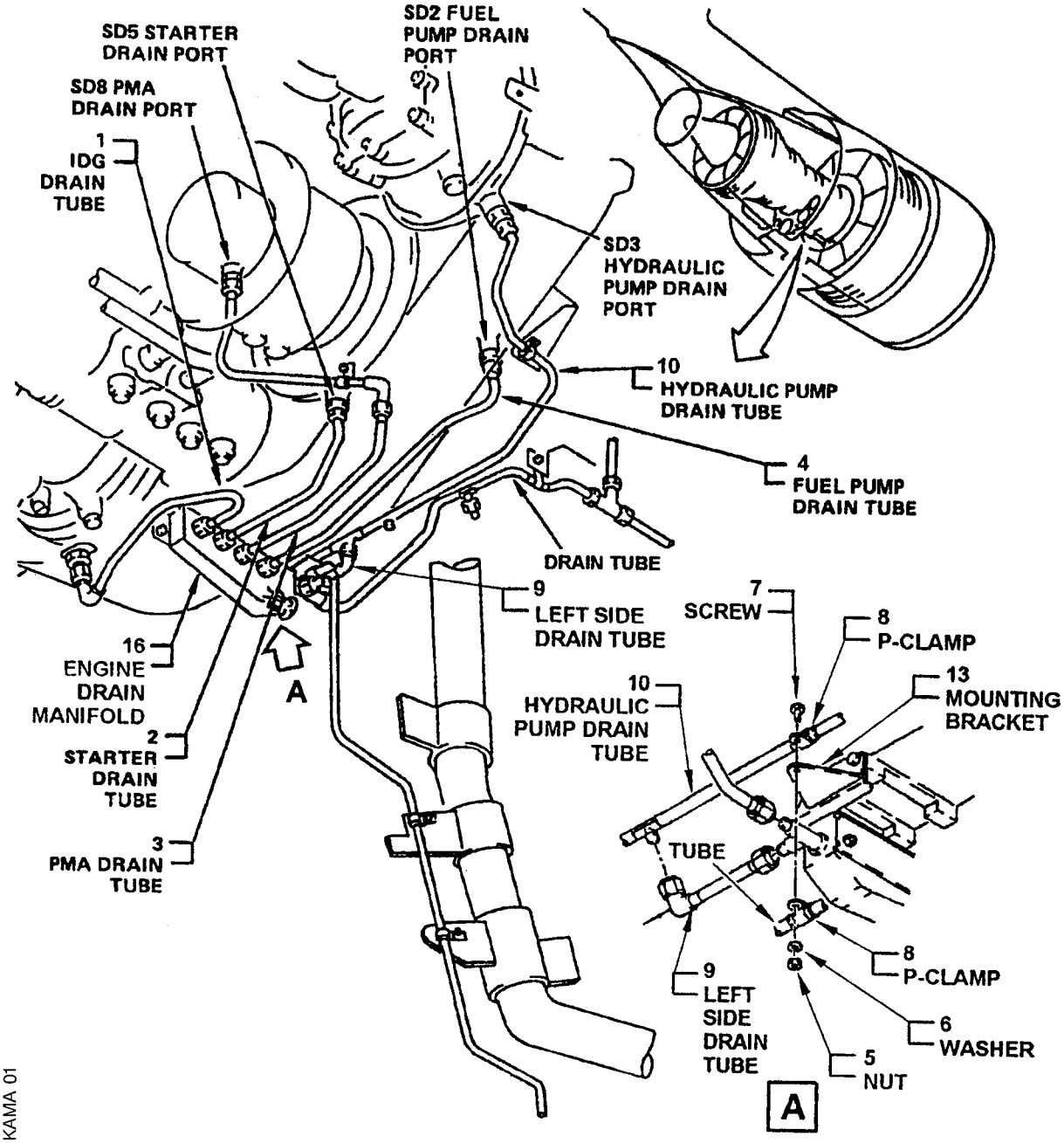
A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Removal (Ref. Fig. 401)
WARNING : BE CAREFUL WHEN DISCONNECTING OIL LINES OR DRAINING OIL FROM AN ENGINE THAT HAS RECENTLY BEEN SHUT DOWN. HOT OIL CAN CAUSE SERIOUS INJURY TO EYES AND SEVERELY BURN SKIN.
(1)Position container to catch residual fluids from drain tubes or manifold. Place protective covers on open ports and drain tubes when opened or removed.
(2)Disconnect IDG drain tube (1), starter drain tube (2), PMA drain tube (3) and fuel pump drain tube (4) from engine drain manifold (16).
(3)Remove nut (5), washer (6), screw (7) and P-clamps (8) from mounting bracket (13).
NOTE : Maintenance time can be reduced by temporarily installing clamps finger tight on the mounting brackets from which they were removed.
(4)Disconnect left side drain tube (9) from the engine drain manifold (16) and hydraulic pump drain tube (10).
(5)Disconnect hydraulic pump drain tube (10) from engine drain manifold (16).
(6)Remove screws (11), washers (12) and mounting bracket (13) from forward end of engine drain manifold (16).
(7)Remove screws (14) and washers (15). Remove engine drain manifold (16) from accessory gear case.

C. Installation (Ref. Fig. 401)
(1)Remove all protective covers.
(2)Attach engine drain manifold (16) to accessory gear case with screw (14) and washer (15), two places. Tighten screws finger tight.
(3)Attach engine drain manifold (16) and mounting bracket (13) to accessory gear case with screw (11) and washer (12), two places. Tighten screws finger tight.
(4)Ensure alignment of engine drain manifold (16). TORQUE screws (11) and

R (14) to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).
R (5) Connect IDG drain tube (1) to engine drain manifold (16) and TORQUE coupling to 300 lbf.in. (3.39 m.daN).
R (6) Connect starter drain tube (2) to engine drain manifold (16) and TORQUE coupling to 300 lbf.in. (3.39 m.daN).
R (7) Connect PMA drain tube (3) to engine drain manifold (16) and TORQUE coupling to 300 lbf.in. (3.39 m.daN).
R (8) Connect fuel pump drain tube (4) to engine drain manifold (16) and TORQUE coupling to 300 lbf.in. (3.39 m.daN).
R (9) Connect hydraulic pump drain tube (10) to fitting on end of engine manifold (16). TORQUE coupling to 300 lbf.in. (3.39 m.daN).
R (10) Connect left side drain tube (9) to fitting on end of engine drain manifold (16) and to hydraulic pump drain tube (10). TORQUE couplings to 300 lbf.in. (3.39 m.daN).
R (11) Attach tubes and P-clamps (8) to mounting bracket (13) with screw (7), washer (6) and nut (5). TORQUE P-clamps (8) to between 20 and 25 lbf.in. R (0.23 and 0.28 m.daN).

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Remove access platform.
(3) Close thrust reverser doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



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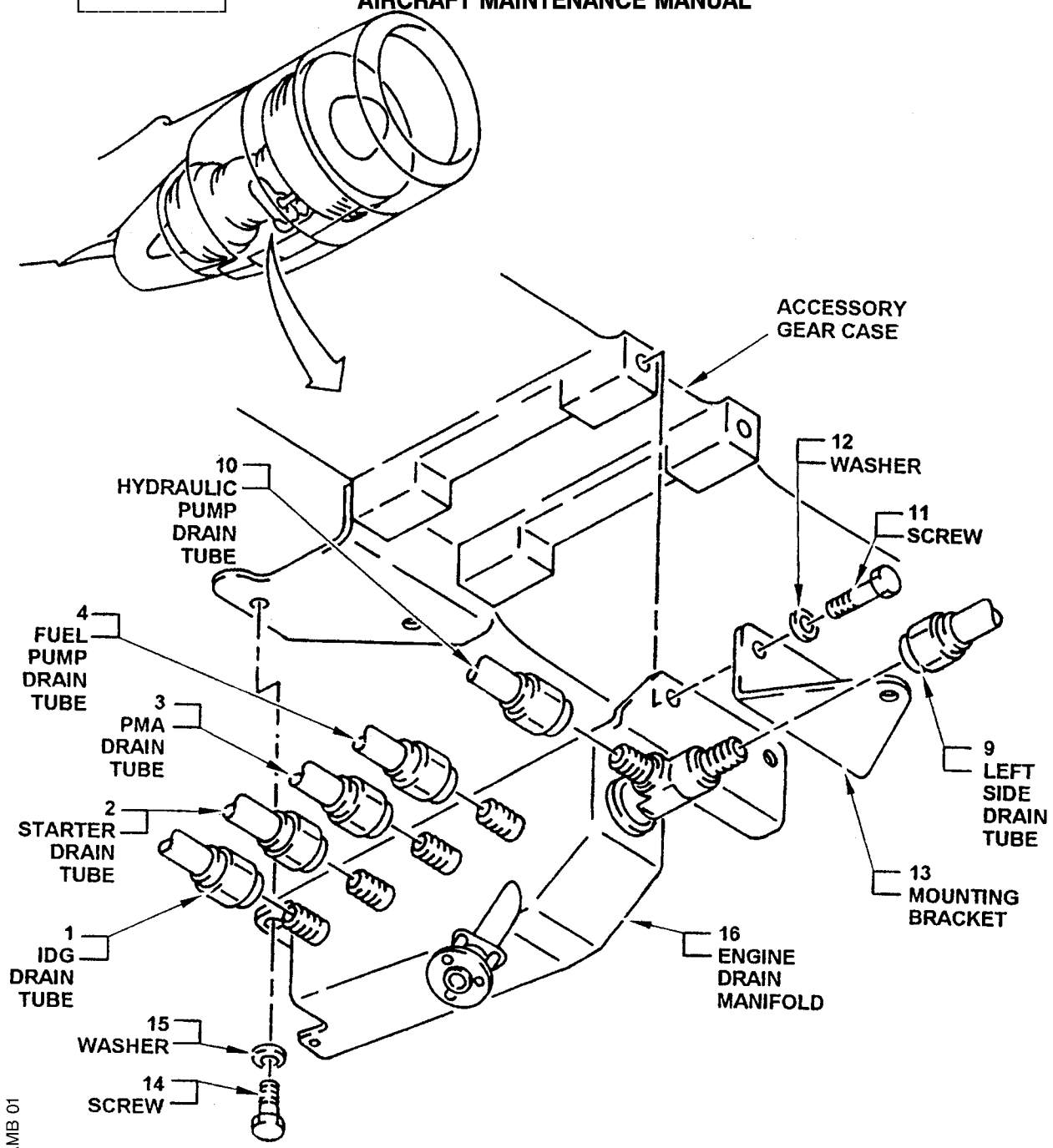
Engine Drain Manifold Assembly - (Sheet 1/2)
Figure 401

R



Engine Drain Manifold Assembly - (Sheet 2/2)
Figure 401

R

ENGINE DRAIN LINES - MAINTENANCE PRACTICES

1. Equipment and materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P05-005	Special Materials (Ref. 70-00-00)

Referenced Procedures

- 71-13-00, P. Block 301	Cowl Doors
- 71-70-14, P. Block 401	Drain Manifold Assembly Engine Drain Lines
- 71-70-51, P. Block 401	Drain Manifold Assembly Engine Drain Lines
- 70-00-00, P. Block 201	Engine - Standard Practices

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove engine drain manifold (Ref. 71-70-14, P. Block 401).
(3)Remove engine drain lines (Ref. 71-70-51, P. Block 401).

B. Inspect and Clean Drain Lines For Coking
(1)Inspect hydraulic drain components for coking.
(a)Blow air through drain outlet mast, pylon drain tubes, drain collector, hydraulic pump drain tubes, and drain manifold to determine if coking is present.
R (b)Clean components if evidence of coking exists (Ref. 70-00-00,
R P. Block 201).
(c)Reinstall components as applicable, if coking is not present. See prerequisites for applicable procedures.
(2)Clean hydraulic drain components if evidence of coking exists (Ref. 70-00-00, P. Block 201).
(3)Dry exterior of components with cloth (Material No.P05-005) and blow dry interior.
(4)Reinstall cleaned components in accordance with applicable procedures listed in prerequisites.

C. Close-Up
(1)Close fan and thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

ENGINE DRAIN LINES - REMOVAL/INSTALLATION

1. Equipment and Materials

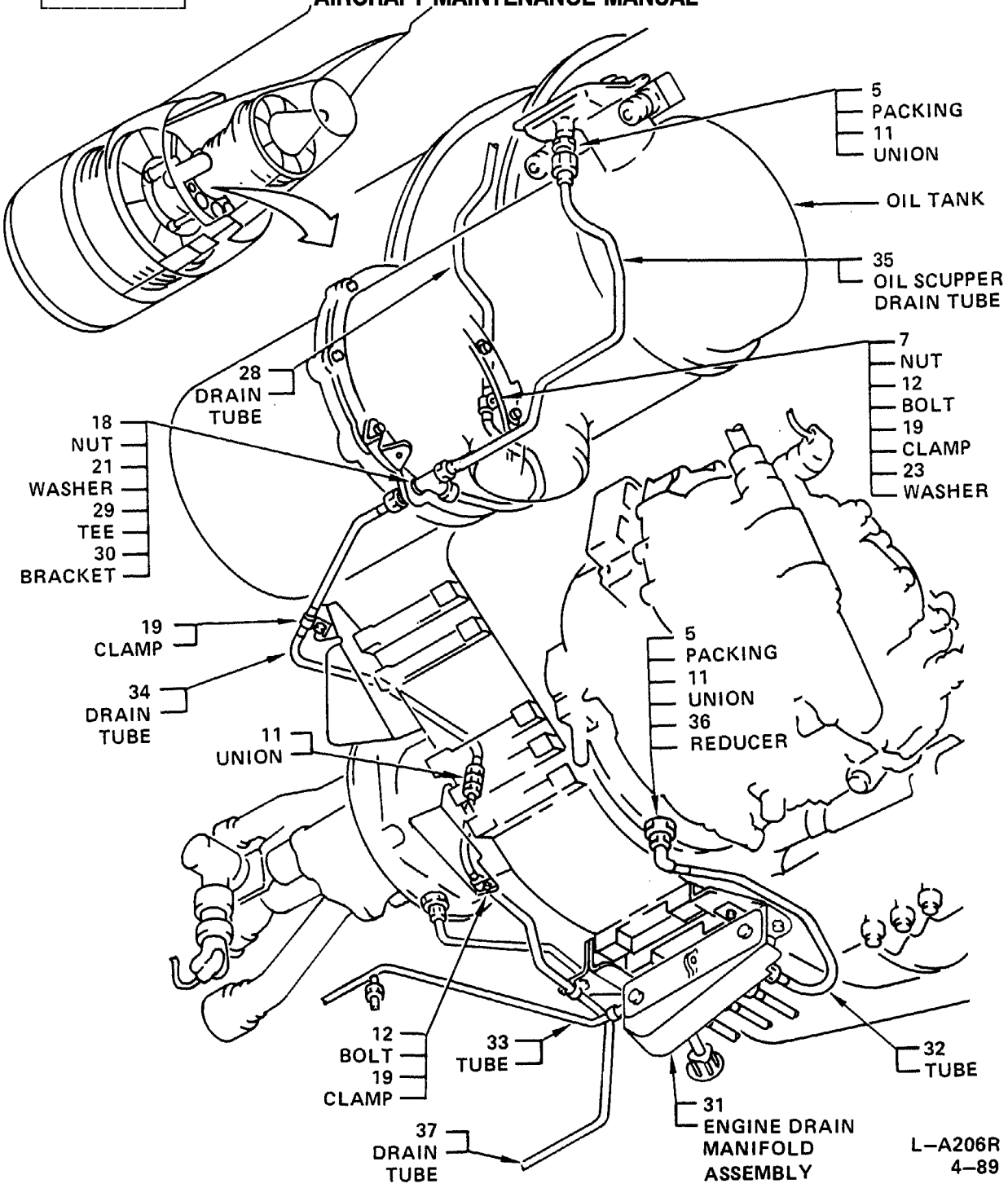
ITEM	DESIGNATION
A.	Access Platform
B.	Circuit Breaker Safety Clips
C.	Torque Wrench
D.	Container, 2US gal (7.5l)
E. Material No.P03-001	Oils (Ref. 70-00-00)
F.	Packing
G.	Protective Covers
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 71-70-14, P. Block 401	Drain Manifold Assembly

2. Procedure (Pre SB PW4 NAC 71-92)

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform
(3)Remove engine drain manifold (Ref. 71-70-14, P. Block 401).

B. Removal
WARNING : BE CAREFUL WHEN DISCONNECTION OIL LINES OR DRAINING OIL FROM AN ENGINE THAT HAS RECENTLY BEEN SHUT DOWN. HOT OIL CAN CAUSE SERIOUS INJURY TO EYES AND SEVERELY BURN SKIN.
(1)Remove pylon drain tubing (Ref. Fig. 401).
NOTE : Place protective covers on open ports and drain tubes during removal procedures.
NOTE : Maintenance time can be reduced by temporarily installing clamps fingertight on the mounting brackets from which they were removed.
(a)Starting at top, left side of engine, Flanges J and K, disconnect and remove pylon hose (1) from union (11) and drain tube (3).
(b)Remove union (11) and discard packing (5).
(c)Remove clamp (4) from drain tube (3).
(d)Disconnect and remove drain tube (3) from bracket (2) and drain tube (25).
(e)Remove clamp (19) from drain tube (25).
(f)Disconnect drain tube (25) from bracket (24) and drain tube (28).
(g)Remove clamp (19) from drain tube (28).
(h)Disconnect and remove drain tube (28) from bracket (27) and tee (29).
(i)Disconnect clamp (19) from drain tube (34).
(j)Disconnect and remove drain tube (34) from tee (29) and union (11).
(k)Remove union (11) and discard packing (5).
(l)Disconnect clamp (19) from drain tube (33) and remove drain tube (33).
(2)Remove oil tank scupper drain tube (35).
(Ref. Fig. 401)
(a)Disconnect and remove oil tank scupper drain tube (35) from union (11)

and tee (29).
(b)Remove tee (29) from bracket (30).
(c)Remove union (11) from oil tank and discard packing (5).
(3)Remove integrated drive generator (IDG) drain tube. (Ref. Fig. 401).
(a)On IDG, port SD6, disconnect and remove IDG drain tube (32).
(b)Remove union (11) from reducer (36) and discard packing (5).
(4)Remove starter drain tube (Ref. Fig. 402).
(a)On pneumatic engine starter, port SD5, Flange K, disconnect and remove starter drain tube (19) from union (11).
(b)Remove union (11) from reducer (33) at port SD5 and discard packing (5).
(5)Remove fuel pump drain tube (Ref. Fig. 402).
(a)On fuel pump, port SD2 (20), Flange J, disconnect and remove fuel pump drain tube (28) from union (11).
(b)Remove union (11) from port SD2 and discard packing (5).
(6)Remove PMA drain tubing (Ref. Fig. 402).
(a)Disconnect and remove PMA drain tube (26) from PMA drain tube (27).
(b)Disconnect and remove clamp (25).
(c)Disconnect and remove PMA drain tube (27) from union (11) at drain port SD8 (22).
(d)Remove union (11) and discard packing (5).
(7)Remove hydraulic pumps drain tube (Ref. Fig. 403).
(a)Remove clamp (3) from hydraulic pumps drain tube (2).
(b)Disconnect and remove hydraulic pump drain tube (2) from union (11) at SD3 and union (11) at SD4.
(c)Remove union (11) from reducer (1) and discard packing (5).
(d)Remove union (11) from reducer (10) and discard packing (5).
(8)Remove TCC cooling actuator drain tubing (Ref. Fig. 402).
(a)Disconnect and remove hose (1) from union (2) and 45 degree elbow (17).
(b)Remove union (2) and discard packing (3).
(c)Remove clamp (7) from drain tube (4).
(d)Disconnect and remove drain tube (4) from 45 degree elbow (17) and cross fitting (14).
(e)Remove clamp (7) from drain tube (15).
(f)Disconnect and remove drain tube (15) from cross fitting (14) and tee (24).
(9)Remove engine vane bellcrank drain tube. (Ref. Fig. 402).
(a)Disconnect and remove clamp (7) that secures electrical cable (32) to drain tube (12).
(b)Remove clamp (7) that secures drain tube (12) to mounting bracket.
(c)Disconnect and remove bellcrank drain tube (12) from union (11) and cross fitting (14).
(d)Remove union (11) and discard packing (5).
(10)Remove air/oil cooler, integrated drive generator (IDG) actuator drain tube (13) (Ref. Fig. 402).
(a)Disconnect and remove air/oil cooler, IDG, drain tube (13) from union (11).
(b)Remove cross fitting (14) from drain tube (13).
(c)Remove union (11) and discard packing (5).



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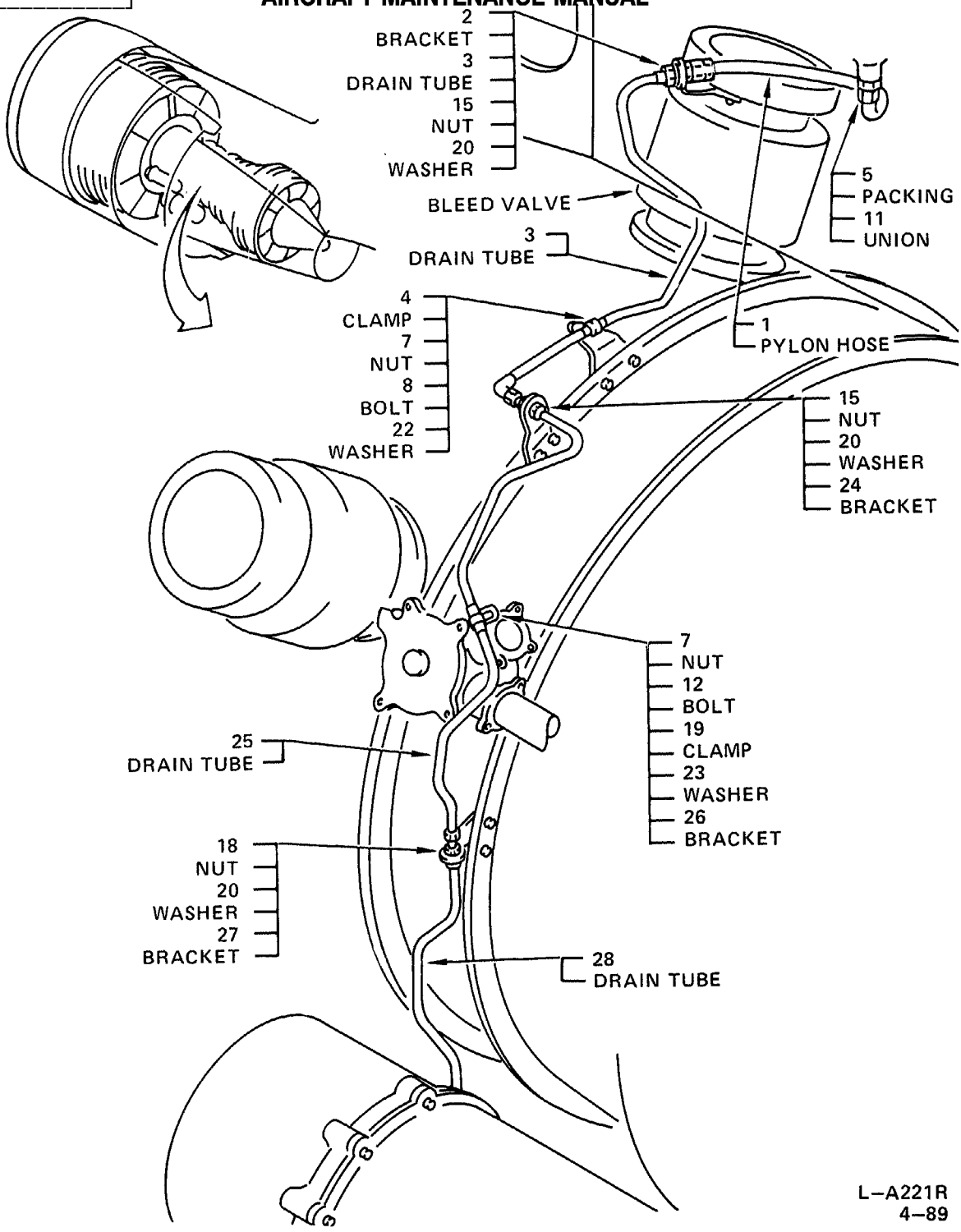
Engine Drain System (Pre SB PW4 NAC 71-92) - Sheet 1
Figure 401



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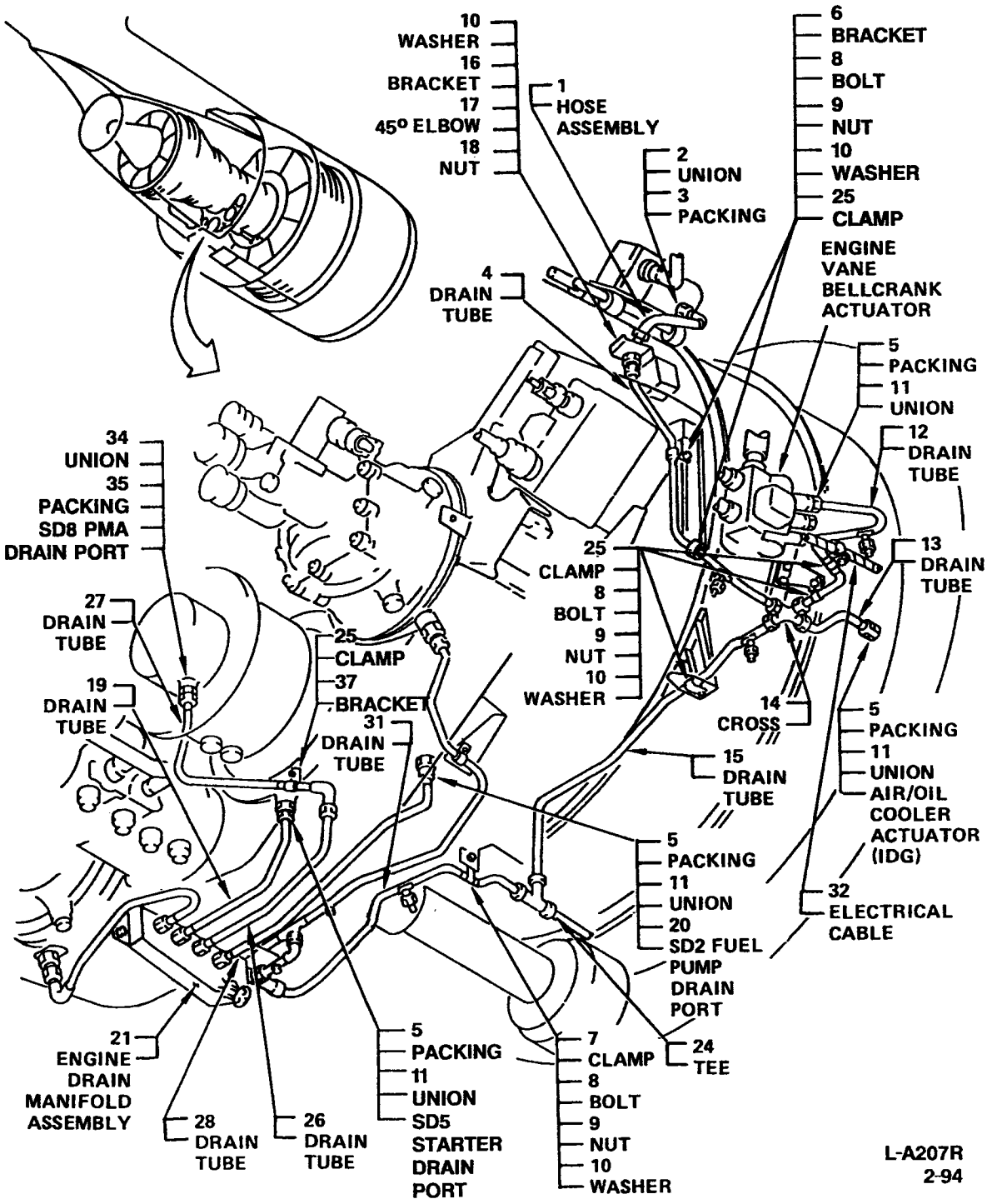
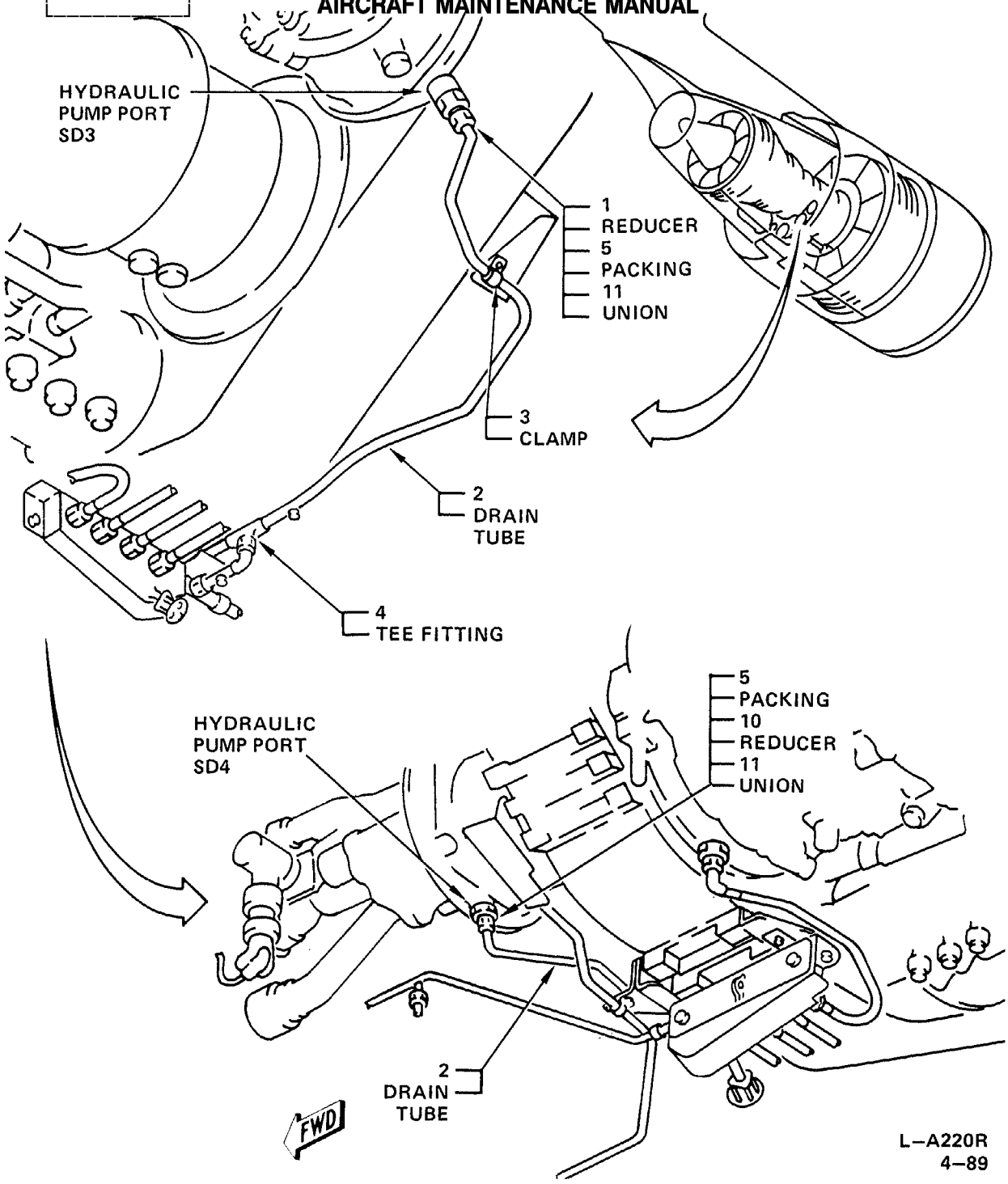
Engine Drain System (Pre SB PW4 NAC 71-92) - Sheet 2
Figure 401



Engine Drain System (Pre SB PW4 NAC 71-92)
Figure 402



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DM5

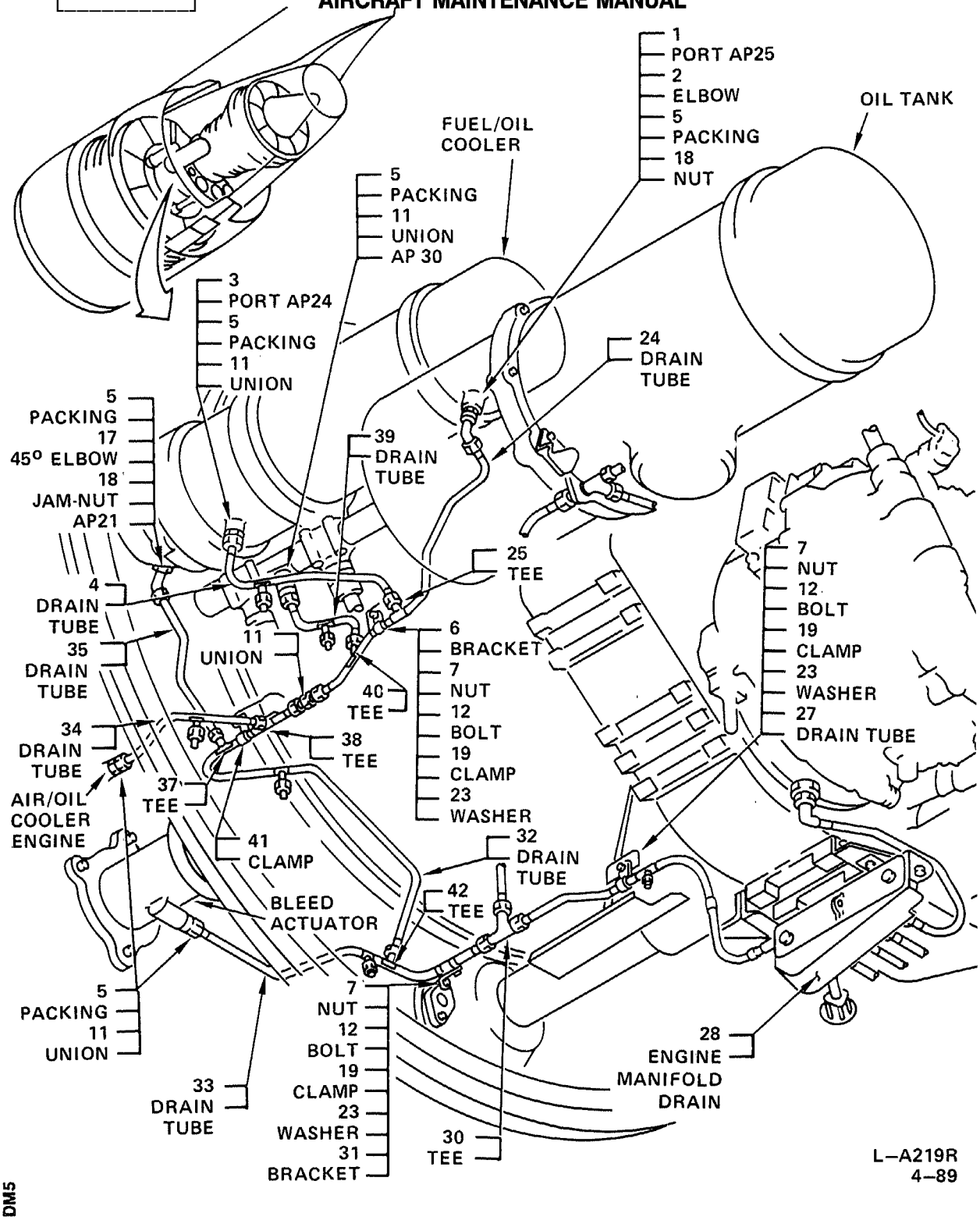
Engine Drain System
Figure 403

(11)Remove fuel/oil cooler, front fuel drain tube (4) at port AP24 (Ref. Fig. 404).
(a)Disconnect and remove drain tube (4) from union (11) and tee (25).
(b)Remove union (11) and discard packing (5).
(12)Remove fuel/oil cooler bypass valve oil drain tube (39) at port AP30 (Ref. Fig. 404).
(a)Disconnect and remove drain tube (39) from union (11) and tee (40).
(b)Remove union (11) and discard packing (5).
(13)Remove fuel/oil cooler IDGS core fuel drain tube (35) at port AP21 (Ref. Fig. 404).
(a)Disconnect and remove tube (35) from elbow (17) and tee (37).
(b)Remove elbow (17) and discard packing.
(14)Remove air/oil cooler, engine, drain tube (34). (Ref. Fig. 404).
(a)Disconnect and remove drain tube (34) from union (11) and tee (38).
(b)Remove union (11) and discard packing (5).
(15)Remove fuel/oil cooler, rear fuel drain tubing at port AP25 (Ref. Fig. 404).
(a)Remove clamp (19) on drain tube (24).
(b)Disconnect and remove drain tube (24) from elbow (2) and union (11).
(c)Remove elbow (2) and discard packing (5).
(d)Remove union (11) from drain tube (32).
(e)Remove clamp (41) from drain tube (32).
(f)Disconnect and remove drain tube (32) from tee (42).
(16)Remove bleed actuator fuel drain (Ref. Fig. 404).
(a)Remove clamp (19) from drain tube (33).
(b)Disconnect and remove drain tube (33) from union (11) and tee (30).
(c)Remove union (11) at bleed actuator port and discard packing (5).
(d)Remove tee (30) from drain tube (27).
(e)Remove clamp (19) from drain tube (27) and remove drain tube (27).
(17)Remove drip pan tube assembly (Ref. Fig. 405).
(a)Remove lower clamp (8) from drip pan tube assembly (1).
(b)Remove washer (4), nut (5) and bolt (3) from bracket (2).
(c)Remove the two middle clamps (8) from drip pan tube assembly (1) and remove assembly.

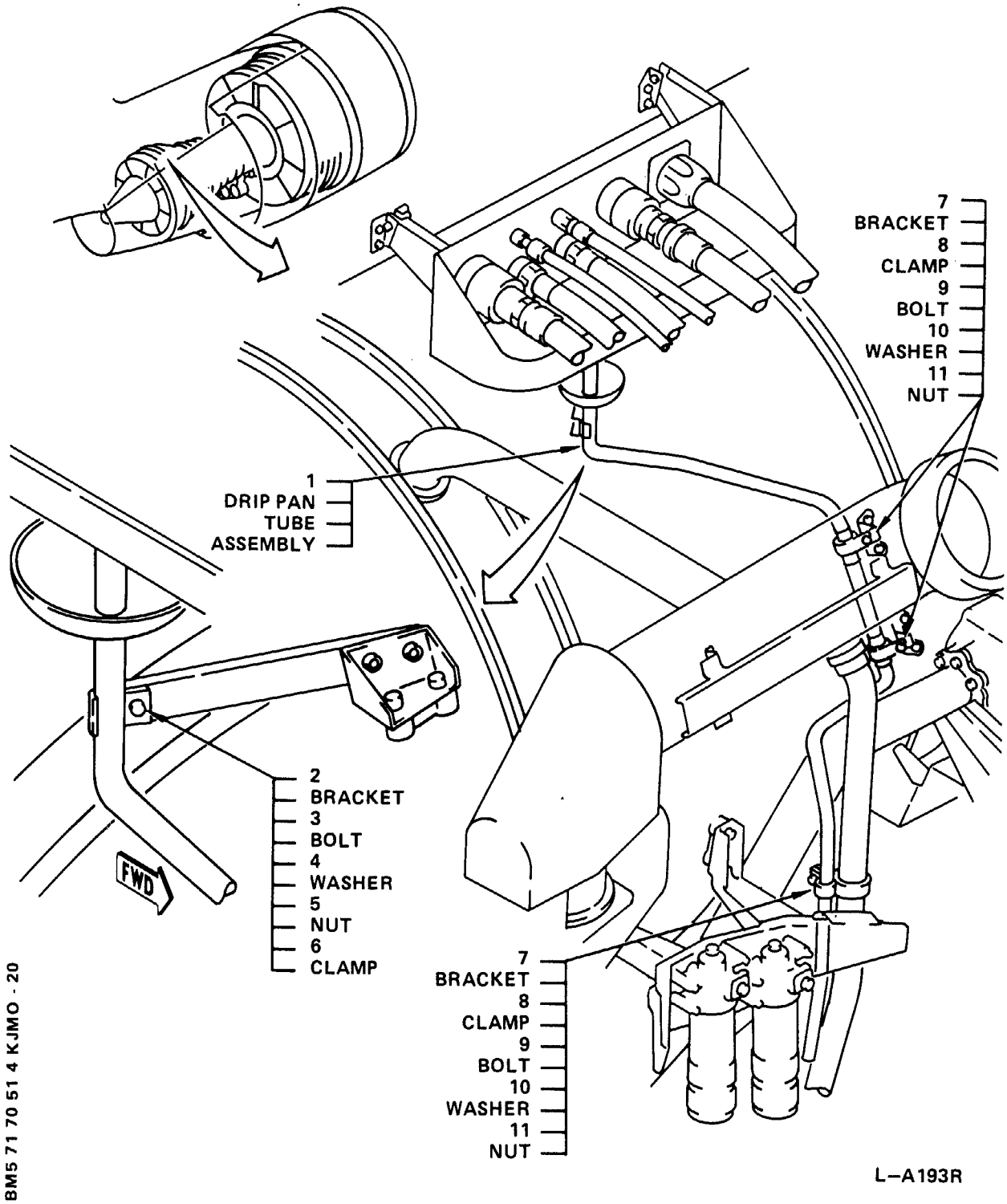
C. Installation

CAUTION : INSTALL DRAIN TUBES, FITTINGS, AND CLAMPS FINGERTIGHT UNTIL DRAIN TUBE ALIGNMENT HAS BEEN VERIFIED OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1)Install engine drain manifold (Ref. 71-70-14, P. Block 401).
(2)Remove all protective covers.
(3)Install hydraulic pumps drain tube (2) (Ref. Fig. 403).
(a)Lubricate packings (5) with Material No. P03-001 and position on unions (11).
(b)Install two unions (11) in reducers (1) and (10) and TORQUE to between 250 and 300 lbf.in (2.82 and 3.39 m.daN).
(c)Install hydraulic drain tube (2) fingertight on unions (11), and tee fitting (4).
(d)Install clamp (3) fingertight on hydraulic pumps drain tube (2).
(e)Ensure alignment of drain tube (2) and TORQUE connectors at two unions



Engine Drain System (Pre SB PW4 NAC 71-92)
Figure 404



Drip Pan Drain Assembly
Figure 405

(11) to 300 lbf.in. (3.39 m.daN).
(f)TORQUE connector on top end of hydraulic pumps discharge tube at tee fitting (4) to 300 lbf.in. (3.39 m.daN).
(g)TORQUE clamp (3) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(h)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(4)Install pylon drain tubing (Ref. Fig. 401).
(a)Install tee (29) on Bracket (30).
(b)Install drain tube (28) on tee (29) and bracket (27).
(c)Install clamp (19) on drain tube (28).
(d)Install drain tube (25) on bracket (24) and drain tube (28).
(e)Install clamp (19) on drain tube (25).
(f)Install drain tube (3) on bracket (2) and drain tube (25).
(g)Install clamp (4) on drain tube (3).
(h)Install union (11) on lower end of drain tube (34).
(i)Install drain tube (34) to tee (29).
(j)Install drain tube (33) to union (11) on lower end of drain tube (34) and to engine drain manifold discharge tube (37).
(k)Install clamp (19) to drain tube (33).
(l)Ensure that all sections of pylon drain system are correctly aligned.
(m)On bracket (30), TORQUE nut (18) on tee (29) to 300 lbf.in (3.39 m.daN).
(n)TORQUE connectors on drain tube (33) to 300 lbf.in. (3.39 m.daN).
(o)On drain tube (33), TORQUE nut on clamp (19) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(p)TORQUE connectors on drain tube (34) to 300 lbf.in. (3.39 m.daN).
(q)On drain tube (34), TORQUE nut on clamp (19) to between 20 and 25 lbf.in (0.23 and 0.28.daN).
(r)On upper end of drain tube (28) TORQUE nut (18) to 600 lbf.in (6.78 m.daN).
(s)On lower end of drain tube (28) TORQUE connector on tee (29) to 300 lbf.in. (3.39 m.daN).
(t)On drain tube (28), TORQUE nut (7) on clamp (19) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(u)On upper end of drain tube (25) TORQUE nut (15) to 600 lbf.in. (6.78 m.daN).
(v)On lower end of drain tube (25) TORQUE connector to 300 lbf.in. (3.39 m.daN).
(w)On drain tube (25), TORQUE nut (7) on clamp (19) to between 20 and 25 lbf.in (0.23 and 0.28 m.daN).
(x)TORQUE nut (15) on bracket (2) to 600 lbf.in. (6.78 m.daN).
(y)On lower end of drain tube (3) TORQUE connector to 300 lbf.in. (3.39 m.daN).
(z)On drain tube (3), TORQUE nut (7) on clamp (4) to between 20 and 25 lbf.in (0.23 and 0.28 m.daN).
(aa)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(ab)Install union (11) at pylon port and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(ac)Install upper end or pylon hose (1) to union (11) and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(ad)Install lower end of pylon hose (1) to drain tube (3) and TORQUE nut

(15) to 600 lbf.in (6.78 m.daN).

(5)Install oil tank scupper drain tube (35) (Ref. Fig. 401).
  (a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
  (b)Install union (11) on oil scupper drain port and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
  (c)Install oil scupper drain tube (35) fingertight on union (11) and tee (29).
  (d)Ensure alignment and TORQUE drain tube (35) connectors to 300 lbf.in. (3.39 m.daN).

(6)Install fuel pump drain tube (28) (Ref. Fig. 402).
  (a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
  (b)Install union (11) on fuel pump drain tube (20) SD2, Flange J, and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
  (c)Install fuel pump drain tube (28) fingertight on union (11) and engine drain manifold at fuel pump input connector.
  (d)Ensure alignment and TORQUE drain tube connectors to 300 lbf.in. (3.39 m.daN).

(7)Install FADEC drain tubing (Ref. Fig. 402).
  (a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
  (b)Install union (11) in PMA drain port (22), SD8, and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
  (c)Install EEC drain tube (27) fingertight on union (11).
  (d)Install clamp (25) fingertight on drain tube (27).
  (e)Install FADEC drain tube (26) fingertight on lower end of FADEC drain tube (27) and engine drain manifold at FADEC input connector.
  (f)Ensure alignment of drain tubes (27) and (26) and TORQUE connectors to 300 lbf.in. (3.39 m.daN).
  (g)On drain tube (27) TORQUE nut on clamp (25) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(8)Install starter drain tube (19) (Ref. Fig. 402).
  (a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
  (b)Install union (11) in reducer (33), at pneumatic engine starter drain port SD5, Flange K, and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
  (c)Install starter drain tube (19) fingertight on union (11) and engine drain manifold at starter input connector.
  (d)Ensure alignment of drain tube (19) and TORQUE connectors to 300 lbf.in. (3.39 m.daN).

(9)Install integrated drive generator (IDG) drain tube (32) (Ref. Fig. 401).
  (a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
  (b)Install union (11) in reducer (36) at IDG port SD6 and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
  (c)Connect IDG drain tube (32) fingertight to union (11) and engine drain manifold at IDG input connector.
  (d)Ensure alignment of drain tube (32) and TORQUE tube connectors to

300 lbf.in. (3.39 m.daN).

(10)Install bleed actuator drain tubing (Ref. Fig. 404).
   (a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
   (b)Install union (11) in bleed actuator drain port and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
   (c)Install tee (30) fingertight on aft end of bleed actuator drain tube (33).
   (d)Connect drain tube (33) to union (11) on bleed actuator drain port.
   (e)Install clamp (19) on drain tube (33).
   (f)Connect drain tube (27) to tee (30) and engine drain manifold direct discharge tube.
   (g)Connect clamp (19) to drain tube (27).
   (h)Connect drain tube (15), (Ref. Fig. 402), fingertight to tee (30), (Ref. Fig. 404).
   (i)Install clamp (31) fingertight on drain tube (15), (Ref. Fig. 402).
      NOTE : Drain tube (15), (Ref. Fig. 402), is installed fingertight at this step to allow tee (30), (Ref. Fig. 404) to be aligned and torqued.
   (j)TORQUE forward end of drain tube (33) on union (11) and aft end on tee (30) to 300 lbf.in. (3.39 m.daN).
   (k)TORQUE clamp (19) on drain tube (33) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
   (l)TORQUE connectors on drain tube (27) to 300 lbf.in, (3.39 m.daN).
   (m)TORQUE clamp (19) on drain tube (27) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
   (n)Install test caps and torque to 150 lbf.in. (1.69 m.daN).
(11)Install fuel/oil cooler, rear fuel drain tubing, AP25. (Ref. Fig. 404).
   (a)Install jamnut (18) fingertight on elbow (2).
   (b)Lubricate packing (5) with Material No.P03-001 and position on elbow (2).
   (c)Install elbow (2) fingertight in port AP25.
   (d)Install union (11) on lower end of drain tube (24).
   (e)Install upper end of drain tube (24) to elbow (2).
   (f)On drain tube (24) install clamp (19) fingertight to bracket (6).
   (g)Install drain tube (32) to union (11), on lower end of drain tube (24), and to tee fitting (42) on drain tube (33).
   (h)Install clamp (41) on drain tube (32).
   (i)Ensure alignment of drain tubes (24) and (32) and TORQUE jamnut (18) on elbow (2) to 300 lbf.in. (3.39 m.daN).
   (j)TORQUE connectors on drain tubes (24) and (32) to 300 lbf.in. (3.39 m.daN).
   (k)TORQUE clamp (19) on drain tube (24) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
   (l)TORQUE clamp (41) on drain tube (32) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
   (m)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(12)Install air/oil cooler, engine, drain tube (34). (Ref. Fig. 404)
   (a)Lubricate packing (5) with Material No.P03-001 and position on union

(11).
(b)Install union (11) in air/oil cooler, engine drain port and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(c)Install drain tube (34) fingertight on union (11) and tee fitting (38).
(d)Ensure alignment of drain tube and TORQUE connectors to 300 lbf.in. (3.39 m.daN).
(e)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(13)Install fuel/oil cooler IDGS core fuel drain tube, AP21 (Ref. Fig. 404).
(a)Install jamnut (18) fingertight on 45 degree elbow (17).
(b)Lubricate packing (5) with Material No.P03-001 and position on 45 degree elbow (17).
(c)Install 45 degree elbow (17) fingertight in drain port AP21.
(d)Install drain tube (35) fingertight on 45 degree elbow (17) and tee fitting (37).
(e)Ensure alignment of drain tube and elbow and TORQUE jamnut (18) to 300 lbf.in. (3.39 m.daN) and drain tube (35) connectors to 300 lbf.in. (3.39 m.daN).
(f)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(14)Install fuel/oil cooler bypass valve oil drain tube (39), AP30 (Ref. Fig. 404).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in port AP30 and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(c)Install drain tube (39) fingertight on union (11) and tee fitting (40).
(d)Ensure alignment of drain tube (39) and TORQUE connectors to 300 lbf.in (3.39 m.daN).
(e)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(15)Install fuel/oil cooler, front fuel drain tubing (4), drain port AP24 (Ref. Fig. 404).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in drain port AP24 and TORQUE to between 250 and 300 lbf.in (2.82 and 3.39 m.daN).
(c)Install drain tube (4) fingertight on union (11) and tee fitting (25).
(d)Ensure alignment of drain tube (4) and TORQUE connectors to 300 lbf.in. (3.39 m.daN).
(e)Install test caps and TORQUE to 150 lbf.in. (1.69 m. daN).
(16)Install turbine case cooling (TCC) actuator drain tubing (Ref. Fig. 402).
(a)Lubricate packing (3) with Material NO.P03-001 and position on union (2).
(b)Install union (2) in TCC actuator drain and TORQUE to 150 lbf.in. (1.69 m.daN).
(c)Install 45 degree elbow (17) fingertight on bracket (16).
(d)Install TCC actuator drain hose (1) fingertight on union (2) and elbow (17).
(e)Ensure alignment of elbow (17) and TORQUE to 300 lbf.in. (3.39 m,daN).
(f)Ensure alignment of drain hose (1) and TORQUE connectors to 300 lbf.in.

(3.39 m.daN).
(g)Install drain tube (4) fingertight on elbow (17) and cross fitting (14).
(h)Install clamp (7) fingertight on drain tube (4) at bracket (6).
(i)Ensure alignment of drain tube (4) on elbow (17) and cross fitting (14), and ensure alignment of drain tube (15) on tee (24) and cross fitting (14).
(j)TORQUE drain tube (4) and drain tube (15) connectors to 300 lbf.in. (3.39 m.daN).
(k)TORQUE clamp (7) on drain tube (15) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(l)TORQUE clamp (7) on drain tube (4) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(m)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(17)Install engine vane bellcrank drain tubing (12). (Ref. Fig. 402).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in engine bellcrank actuator port and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(c)Install drain tube (12) fingertight to union (11) and cross fitting (14).
(d)Install clamp (7) fingertight that clamps electrical cable (32) to drain tube (12).
(e)Install clamp (7) fingertight that clamps drain tube (12) to mounting bracket.
(f)Ensure that drain tube (12) and clamps (7) are aligned.
(g)TORQUE drain tube (12) connectors to 300 lbf.in (3.39 m.daN).
(h)TORQUE two clamps (7) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(i)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(18)Install air/oil cooler, integrated drive generator (IDG) actuator drain tube (13) (Ref. Fig. 402).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in IDG actuator drain port and TORQUE to between 250 and 300 lbf.in. (2.82 and 3.39 m.daN).
(c)Install drain tube (13) fingertight to union (11) and cross fitting (14).
(d)Ensure alignment of drain tube (13) and TORQUE to 300 lbf.in. (3.39 m.daN).
(19)Install drip pan tube assembly (Ref. Fig. 405)
(a)Install drip pan tube assembly (1) fingertight to bracket (2) with bolt (3), washer (4) and nut (5).
(b)Install the two middle clamps (8) fingertight to drip pan tube assembly (1) with bolts (9), washers (10) and nuts (11).
(c)Install the lower clamp (8) fingertight to drip pan tube assembly (1) with bolts (9), washers (10) and nuts (11).
(d)Ensure that drip pan tube assembly (1) is correctly positioned and TORQUE nut (5) on bracket (2) to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).
(e)TORQUE nuts (11) on clamps (8) to between 20 and 25 lbf.in. (0.23 and

0.28 m.daN).

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

3. Procedure (Post SB PW4 NAC 71-92)

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform
(3)Remove engine drain manifold (Ref. 71-70-14, P. Block 401).

B. Removal
WARNING : BE CAREFUL WHEN DISCONNECTING OIL LINES OR DRAINING OIL FROM A HOT ENGINE THAT HAS RECENTLY BEEN SHUT DOWN. HOT OIL CAN CAUSE SERIOUS INJURY TO EYES AND SEVERELY BURN SKIN.
(1)Remove pylon drain tubing (Ref. Fig. 406).
NOTE : Place protective covers on open ports and drain tubes during removal procedures.
NOTE : Maintenance time can be reduced by temporarily installing clamps fingertight on the mounting brackets from which they were removed.
(a)Starting at top, left side of engine, Flanges J and K, disconnect and remove pylon hose (1) from union (11) and drain tube (3).
(b)Remove union (11) and discard packing (5).
(c)Remove clamp (4) from drain tube (3) at bracket (6).
(d)Disconnect and remove drain tube (3) from bracket (2) and drain tube (25).
(e)Remove two clamps (19) from drain tube (25) at brackets (26) and (27).
(f)Disconnect and remove drain tube (25) from union (9) and union (38) at drain tube (28).
(g)Remove clamp (39) from drain tube (28) at bracket (43). (Ref. Fig. 406), (Sheet 2).
(h)Remove clamp (19) from drain tube (28) at bracket existing engine bracket.
(i)Disconnect and remove drain tube (28) from bracket (27) and union (38).
(j)Disconnect clamps (19) from drain tube (46) at bracket (48) and (49).
(k)Disconnect and remove drain tube (46) from union (38) at drain mast on Flange P.
(l)Remove union (38).
(2)Remove oil tank scupper drain tube (35) (Ref. Fig. 406), (Sheet 3).
(a)Disconnect and remove oil tank scupper drain tube (35) from union (11) and union (29).
(b)Remove nut (18) and union (29) from bracket (30).
(c)Remove union (11) from oil tank and discard packing (5).
(3)Remove integrated drive generator (IDG) drain tube (32). (Ref. Fig. 406), (Sheet 3).

(a)On IDG, port SD6, disconnect and remove IDG drain tube (32) from union (11) and engine drain manifold (31).
(b)Remove union (11) and discard packing (5).

(4)Remove starter drain tube (Ref. Fig. 407).
(a)On pneumatic engine starter, port SD5, disconnect and remove starter drain tube (19) from union (11) and engine drain manifold (21).
(b)Remove union (11) from port SD5 and discard packing (5).

(5)Remove fuel pump drain tube (Ref. Fig. 407).
(a)On fuel pump, port SD2 (20), disconnect and remove fuel pump drain tube (28) from union (11) and drain manifold (21).
(b)Remove union (11) from port SD2 and discard packing (5).

(6)Remove PMA drain tubing (26) and (27) (Ref. Fig. 407).
(a)Remove clamp (25) from bracket (37).
(b)On PMA, port SD8, disconnect and remove PWA drain tube (27) from union (34) and PMA drain tube (26).
(c)Remove union (34) from port SD8 and discard packing (35).
(d)Disconnect and remove PMA drain tube (26) from engine drain manifold (21).

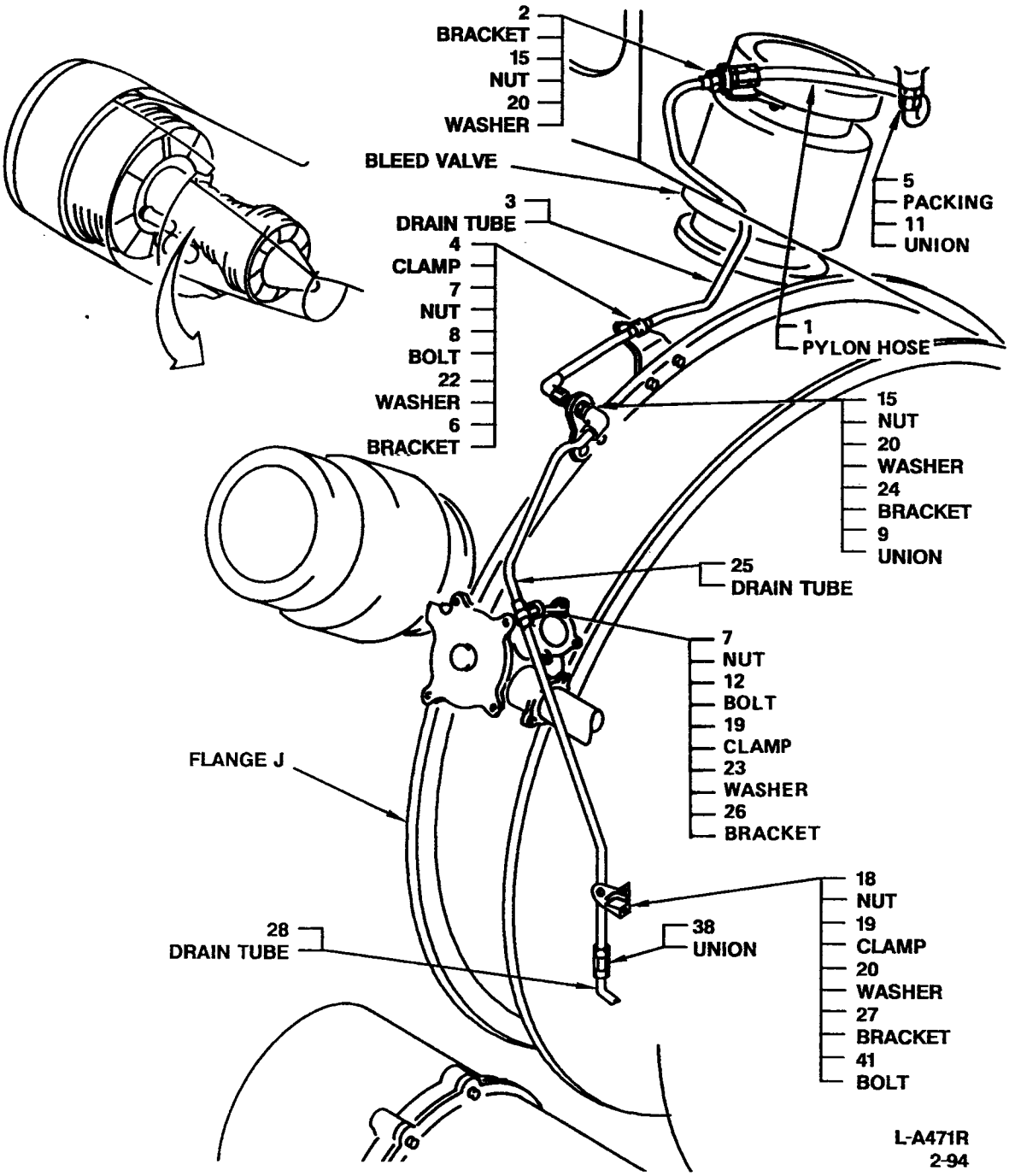
(7)Remove hydraulic pumps drain tube (2) (Ref. Fig. 408).
(a)Remove clamp (3) from hydraulic pumps drain tube (2).
(b)Disconnect drain tube (2) from drain tube (4).
(c)Disconnect and remove hydraulic pump drain tube (2) from union (11) at port SD3 and union (11) at port SD4.
(d)Remove union (11) from port SD3 and union (11) from port SD4 and discard packings (5).

(8)Remove TCC actuator drain tubes (Ref. Fig. 407).
(a)Disconnect hose (1) from union (2) in TCC cooling actuator port.
(b)Remove nut (18) attaching hose (1) to 45 degree elbow (17) at bracket (16) and remove hose (1).
(c)Remove union (2) and discard packing (3).
(d)Remove clamps (25) from drain tube (4).
(e)Disconnect and remove drain tube (4) from bracket (16) and cross (14).
(f)Remove clamp (25) from drain tube (15).
(g)Disconnect and remove drain tube (15) from cross (14) and tee (24).

(9)Remove engine vane bellcrank drain tube. (Ref. Fig. 407).
(a)Disconnect and remove clamp (25) that secures electrical cable (32) to drain tube (12).
(b)Remove clamp (25) that secures drain tube (12) to mounting bracket.
(c)Disconnect and remove bellcrank drain tube (12) from union (11) in engine vane bellcrank actuator port and cross (14).
(d)Remove union (11) and discard packing (5).

(10)Remove air/oil cooler, integrated drive generator (IDG) actuator drain tube (13). (Ref. Fig. 407).
(a)Disconnect and remove air/oil cooler drain tube (13) from union (11).
(b)Remove cross (14) from drain tube (13).
(c)Remove union (11) and discard packing (5).

(11)Remove fuel/oil cooler, front fuel drain tube (4) at port AP24 (Ref. Fig. 409).
(a)Disconnect and remove drain tube (4) from union (11) and tube (24).
(b)Remove union (11) and discard packing (5).



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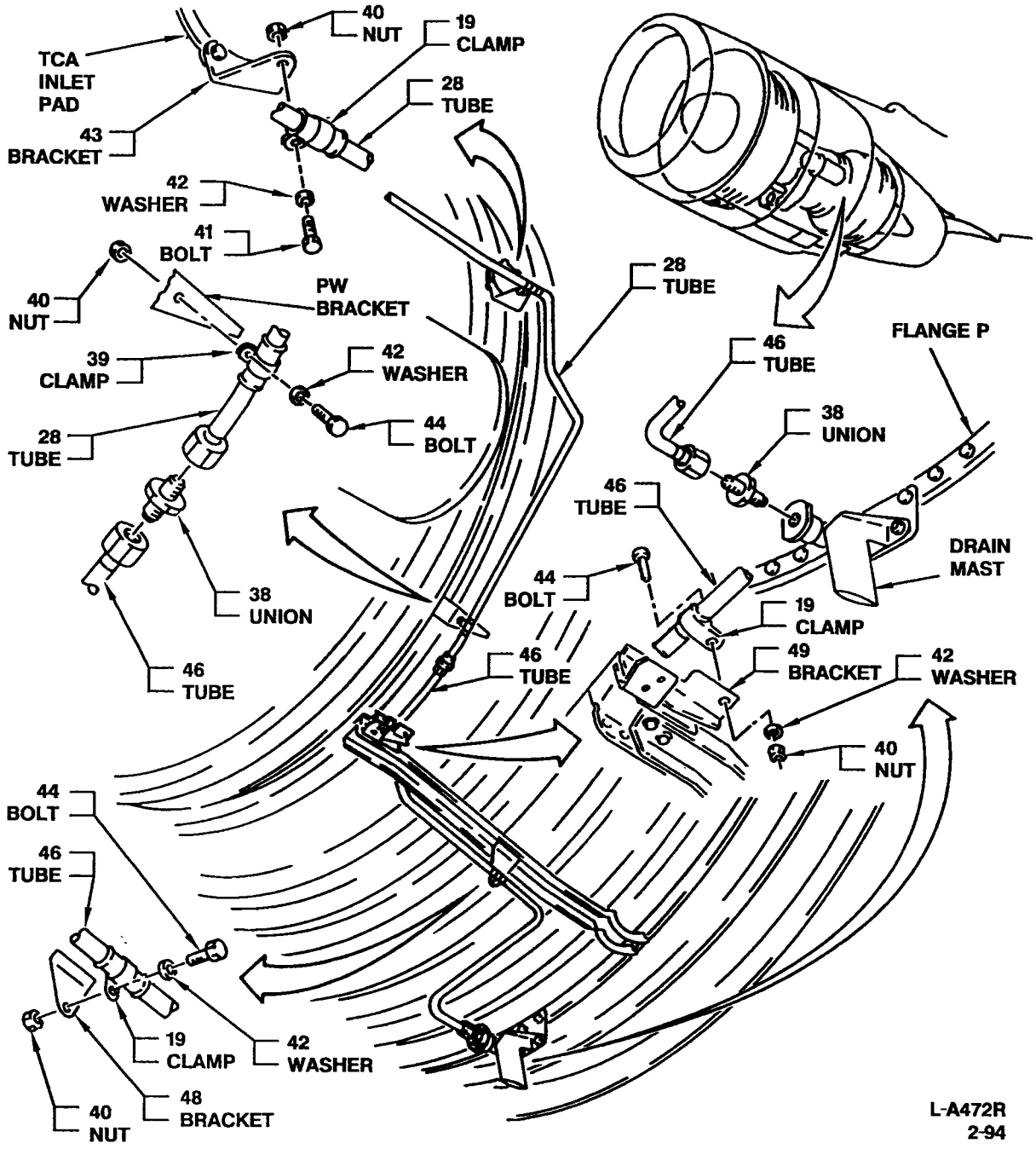
Engine Drain System (Post SB PW4 NAC 71-92) (Sheet 1/3)
Figure 406



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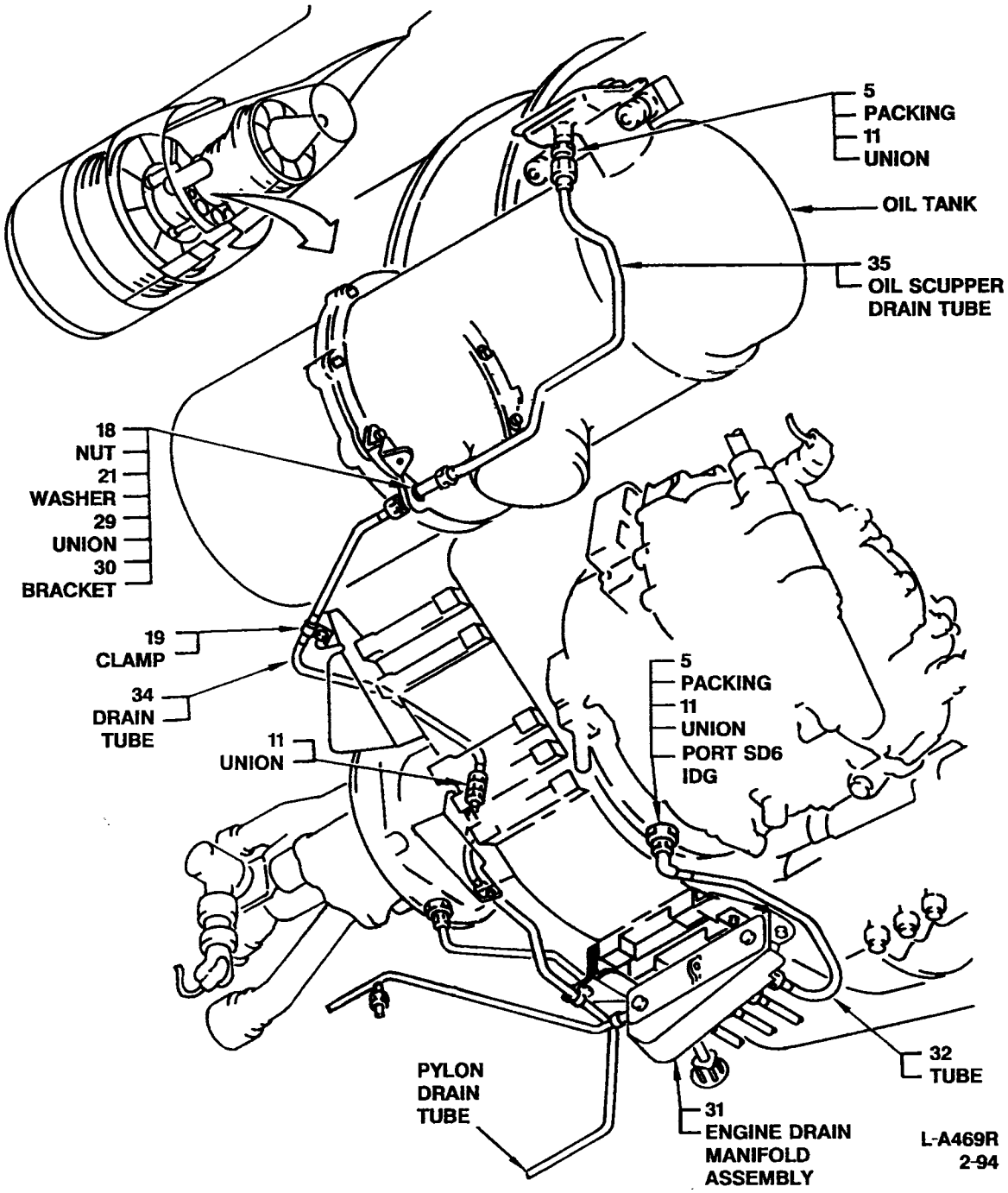
Engine Drain System (Post SB PW4 NAC 71-92) (Sheet 2/3)
Figure 406



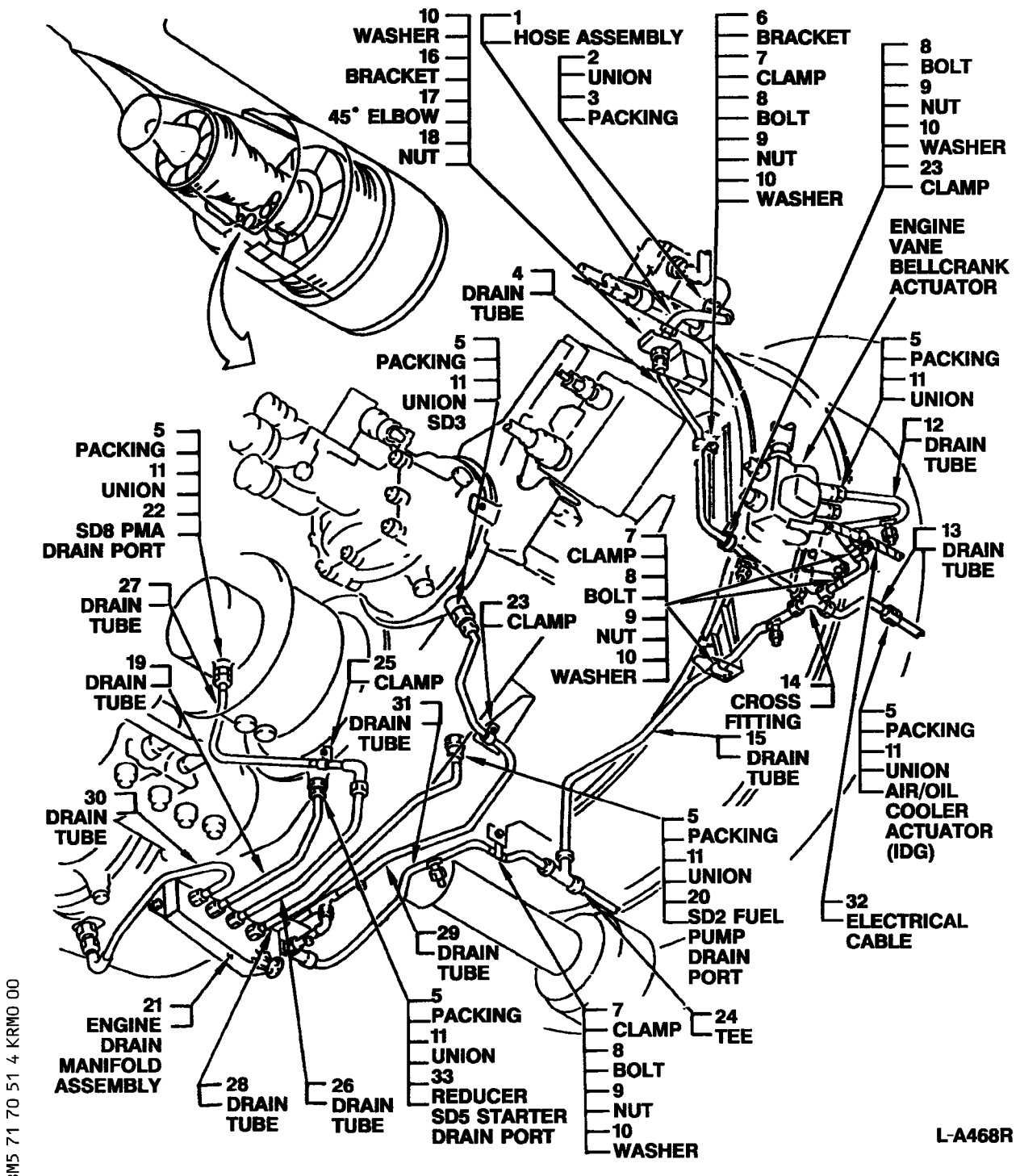
Engine Drain System (Post SB PW4 NAC 71-92) (Sheet 3/3)
Figure 406

(12)Remove fuel/oil cooler bypass valve oil drain tube (39) at port AP30 (Ref. Fig. 409).
(a)Disconnect and remove drain tube (39) from union (11) and tube (37).
(b)Remove union (11) and discard packing (5).
(13)Remove fuel/oil cooler core fuel drain tube (35) at port AP21. (Ref. Fig. 409)
(a)Remove tube (35) from elbow on fuel/oil cooler and drain tube (37).
(b)Disconnect nut (18) and remove elbow (17) and discard packing (5).
(14)Remove fuel/oil cooler, rear fuel drain tubing at port AP25. (Ref. Fig. 409)
(a)Remove clamp (19) on drain tube (24) at existing engine bracket.
(b)Remove nut (18) attaching drain tube (24) to elbow at port AP25.
(c)Disconnect and remove drain tube (24) from elbow (2) and union in drain tube (37).
(d)Remove elbow (2) and discard packing (40).
(e)Remove clamp (19) on drain tube (37) at bracket (42).
(f)Disconnect and remove drain tube (37) from drain tube (32).
(g)Remove clamp (19) on drain tube (32) at bracket (44).
(h)Disconnect drain tube (32) from air/oil cooler port AP18.
(i)Disconnect and remove air/oil cooler drain tube (32) from drain tube (33).
(15)Remove 2.5 bleed actuator drain tube and hose (Ref. Fig. 409).
(a)Disconnect and remove hose assembly (46) from union (11) in port FD19 from 2.5 bleed actuator.
(b)Remove union (11) from port FD19 and discard packing (5).
(c)Remove clamp (19) on drain tube (33) at bracket (31).
(d)Disconnect and remove drain tube (33) from tee (30).
(e)Remove tee (30) from drain tube (27).
(f)Remove clamp (19) from drain tube (27).
(g)Disconnect and remove drain tube (27) from engine drain manifold (28).
(16)Remove pylon drain tube assembly (1) (Ref. Fig. 410).
(a)Remove bolt (3), washer (4) and nut (5) attaching pylon drain tube (1) to bracket (2).
(b)Remove two clamps (8) attaching pylon drain tube (1) to two engine brackets on fuel nozzle pad.
(c)Remove two clamps (8) and (12) attaching pylon drain tube (1) to starter valve cooling tube.
(d)Remove pylon drain tube (1) from engine.

C. Installation

CAUTION : INSTALL DRAIN TUBES, FITTING, AND CLAMPS FINGERTIGHT UNTIL DRAIN TUBE ALIGNMENT HAS BEEN VERIFIED OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1)Install engine drain manifold (Ref. 71-70-14, P. Block 401).
(2)Remove all protective covers from drain tubes and ports.
(3)Install hydraulic pumps drain tube (2) (Ref. Fig. 408).
(a)Lubricate packing (5) with Material No.P03-001 and position on unions (11).
(b)Install two unions (11) in hydraulic pump port SD4 and hydraulic pump port SD3 and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).



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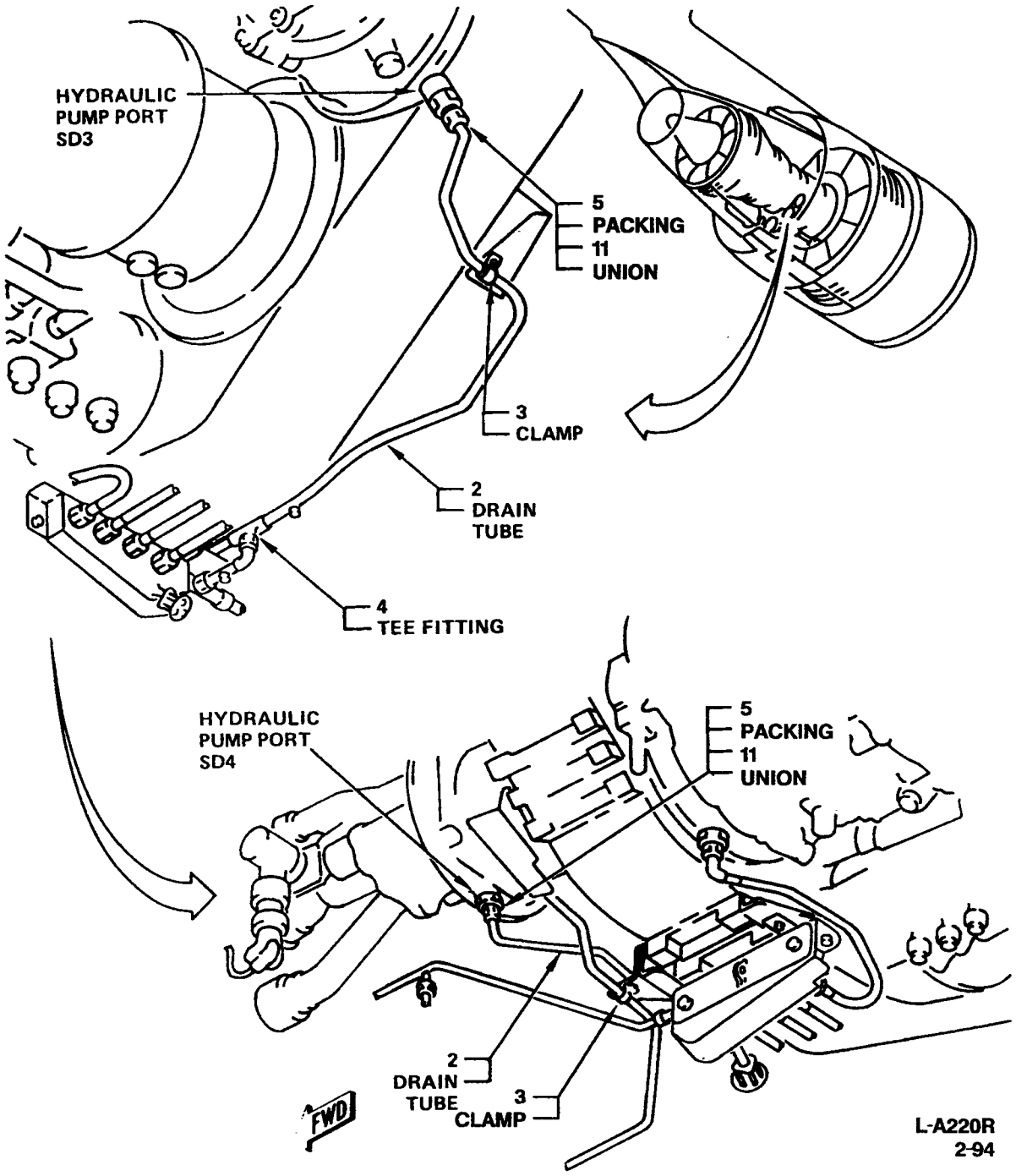
Engine Drain System (Post SB PW4 NAC 71-92)
Figure 407



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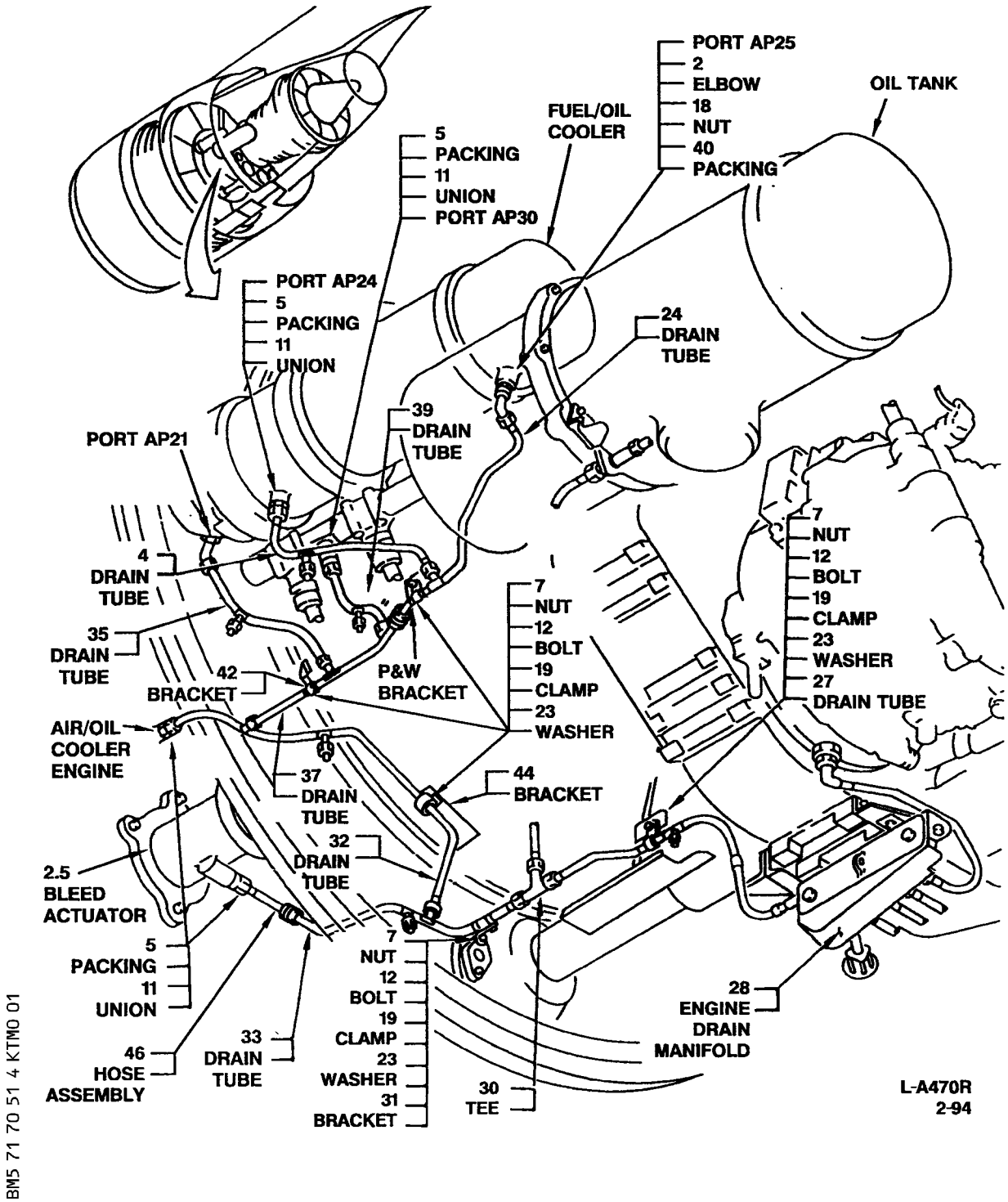
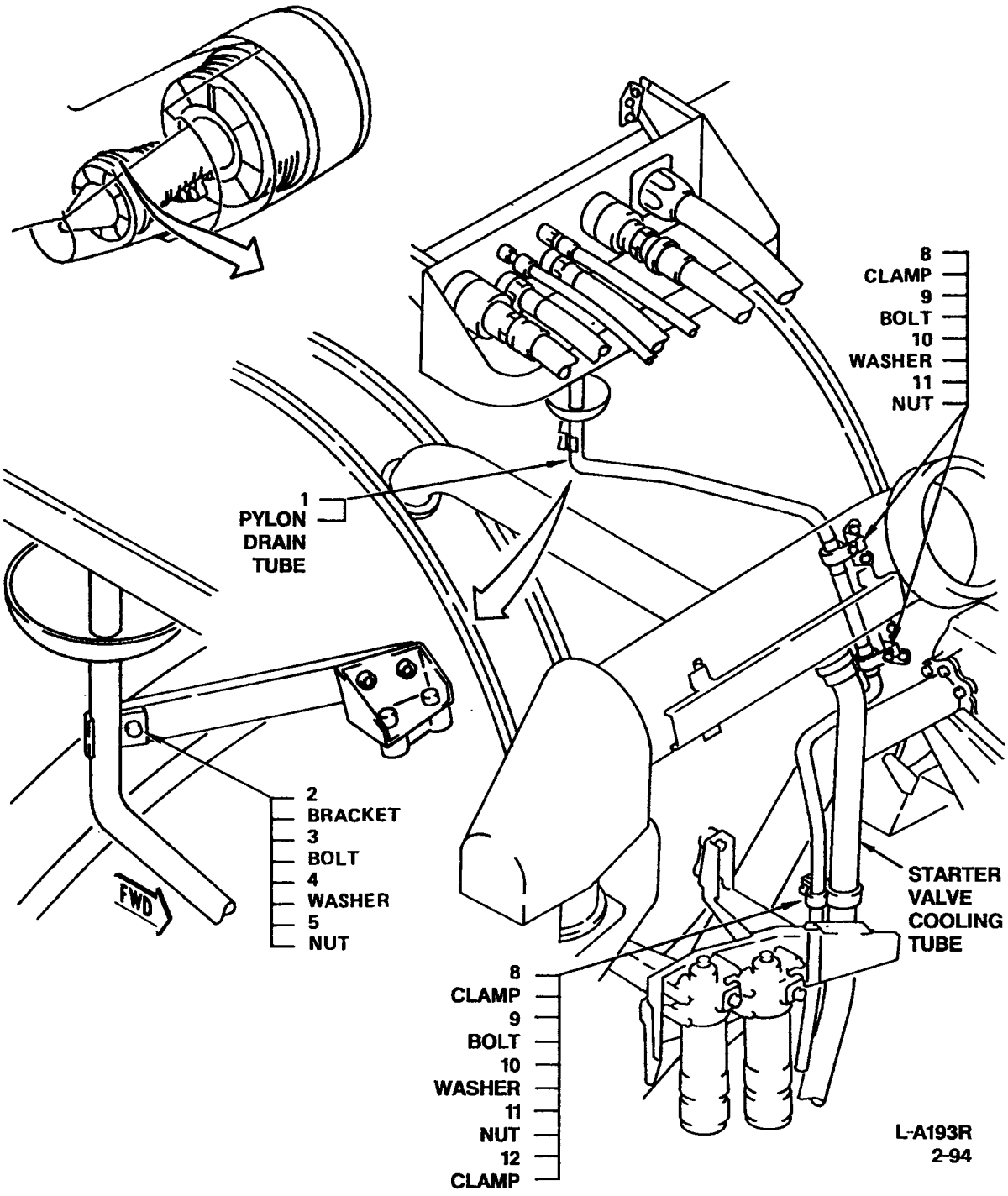
Engine Drain System
Figure 408



BM5 71 70 51 4 KTMO 01

Engine Drain System (Post SB PW4 NAC 71-92)
Figure 409



Drip Pan Drain Assembly
Figure 410

(c)Install hydraulic drain tube (2) fingertight on unions (11), and tee fitting (4).
(d)Install clamp (3) fingertight on hydraulic pumps drain tube (2).
(e)Ensure alignment of drain tube (2) and TORQUE connectors at two unions (11) to 300 lbf.in. (3.38 m.daN).
(f)TORQUE connector on top end of hydraulic pumps discharge tube at tee fitting (4) to 300 lbf.in. (3.38 m.daN).
(g)TORQUE clamp (3) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(h)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).

(4)Install pylon drain tubing (Ref. Fig. 406).
(a)Install union (38) in drain mast and TORQUE union to between 215 and 240 lbf.in. (2.43 and 2.71 m.daN).
(b)Install drain tube (46) on bracket (48) using clamp (19), bolt (44), washer (42), and nut (40).
TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(c)Install drain tube (46) on bracket (49) using clamp (19), bolt (44), washer (42), and nut (40).
TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(d)Connect drain tube (46) lower coupling nut to union (38) and TORQUE coupling to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN).
(e)Install union (38) in upper end of drain tube (46) and TORQUE union to between 215 and 240 lbf.in. (2.43 and 2.71 m.daN).
(f)Install drain tube (28) on engine bracket using clamp (39), bolt (44), washer (42), and nut (40).
TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(g)Install drain tube (28) on TCA inlet pad bracket (43) using clamp (19), bolt (41), washer (42), and nut (40).
TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(h)Connect drain tube (28) coupling nut to union (38) and TORQUE to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN).
(i)Install drain tube (25) at bracket (27) using clamp (19), bolt (41), washer (20), and nut (18).
Do not TORQUE nut at this time.
(j)Install drain tube (25) on bracket (26) at 15th stage pad using clamp (19), bolt (12), washer (23) and nut (7).
Do not TORQUE nut at this time.
(k)Connect drain tube (25) lower coupling nut to union (38) and TORQUE coupling to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN).
(l)Install drain tube (3) to bracket (6) on Flange J using clamp (4), bolt (8), washer (22), and nut (7). TORQUE nut to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(m)Install union (9) in lower coupling of drain tube (3) and TORQUE to between 215 and 240 lbf.in. (2.43 and 2.71 m.daN).
(n)Connect upper end of drain tube (3) to bracket (2) using nut (15) and washer (20). TORQUE nut (15) to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN).
(o)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(p)Install union (11) in pylon port and TORQUE union to between 215 and 240 lbf.in. (2.43 and 2.71 m.daN).
(q)Install pylon drain hose (1) to union (11) and TORQUE hose coupling

to between 215 and 240 lbf.in. (2.43 and 2.71 m.daN).

(r) Connect pylon hose (1) to drain tube (3) at bracket (2) using washer (20) and nut (15). TORQUE nut to between 215 and 240 lbf.in. (2.43 and 2.71 m.daN).

(s) Install drain tube (3) with union (9) to bracket (24). TORQUE coupling nut to 450 and 500 lbf.in. (5.09 and 5.64 m.daN).

(t) Install drain tube (25) to union (9) at bracket (24). TORQUE coupling nut to 215 and 240 lbf.in. (2.43 and 2.71 m.daN).

(u) TORQUE nut on clamp (19) on drain tube (25) at bracket (27) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(v) TORQUE nut on clamp (19) on drain tube (25) at bracket (26) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(5) Install oil tank scupper drain tube (35). (Ref. Fig. 406) (Sheet 3/3).

(a) Lubricate packing (5) with Material No.P03-001 and position on union (11).

(b) Install union (11) on oil scupper drain port and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).

(c) Install union (29) on bracket (30) using washer (21) and nut (18), nut on aft of bracket. TORQUE nut to between 125 and 140 lbf.in. (1.42 and 1.59 m.daN).

(d) Ensure alignment and TORQUE drain tube (35) connectors to 300 lbf.in. (3.38 m.daN).

(6) Install fuel pump drain tube (28) (Ref. Fig. 407).

(a) Lubricate packing (5) with Material No.P03-001 and position on union (11).

(b) Install union (11) on fuel pump drain tube (20), SD2, Flange J, and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).

(c) Install fuel pump drain tube (28) fingertight on union (11) and engine drain manifold at fuel pump input connector.

(d) Ensure alignment and TORQUE drain tube connectors to 300 lbf.in. (3.38 m.daN).

(7) Install PMA drain tubing (Ref. Fig. 407).

(a) Lubricate packing (35) with Material No.P03-001 and position on union (11).

(b) Install union (34) in PMA drain port (22), SD8, and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).

(c) Install EEC drain tube (27) fingertight on union (34).

(d) Install clamp (25) fingertight on drain tube (27) at bracket (37).

(e) Install EEC drain tube (26) fingertight on lower end of EEC drain tube (27) and engine drain manifold (21) at EEC input connector.

(f) Ensure alignment of drain tubes (27) and (26) and TORQUE connectors to 300 lbf.in. (3.38 m.daN).

(g) On drain tube (27) TORQUE nut on clamp (25) at bracket (37) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

(8) Install starter drain tube (19) (Ref. Fig. 407).

(a) Lubricate packing (5) with Material No.P03-001 and position on union (11).

(b) Install union (11) at pneumatic engine starter drain port SD5, Flange K, and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).

(c) Install starter drain tube (19) fingertight on union (11) and engine

drain manifold at starter input connector.
(d)Ensure alignment of drain tube (19) and TORQUE connectors to 300 lbf.in. (3.38 m.daN).
(9)Install integrated drive generator (IDG) drain tube (32). (Ref. Fig. 406) (Sheet 3/3).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) at IDG port SD6 and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Connect IDG drain tube (32) fingertight to union (11) and engine drain manifold at IDG input connector.
(d)Ensure alignment of drain tube (32) and TORQUE tube connectors to 300 lbf.in. (3.38 m.daN).
(10)Install bleed actuator drain tubing. (Ref. Fig. 409)
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in bleed actuator drain port and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Connect hose assembly (46) to union (11) and drain tube (33).
(d)Install tee (30) fingertight on aft end of bleed actuator drain tube (33).
(e)Install clamp (19) on drain tube (33) and connect to bracket (31) using bolt (12), washer (23) and nut (7). Do not TORQUE nut.
(f)Connect drain tube (27) to tee (30) and engine drain manifold direct discharge tube.
(g)Connect clamp (19) to drain tube (27).
(h)Connect drain tube (15), (Ref. Fig. 407), fingertight to tee (30), (Ref. Fig. 409).
(i)Install clamp (25) fingertight on drain tube (15) connect to bracket (39) using bolt (8), washer (10) and nut (9) (Ref. Fig. 407).
NOTE : Drain tube (15), (Ref. Fig. 407), is installed fingertight at this step to allow tee (30), (Ref. Fig. 409) to be aligned and torqued.
(j)TORQUE forward end of drain tube (33) at hose assembly (46) and aft end on tee (30) to 300 lbf.in. (3.38 m.daN).
(k)TORQUE clamp (19) on drain tube (33) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(l)TORQUE connectors on drain tube (27) to 300 lbf.in. (3.38 m.daN).
(m)TORQUE clamp (19) on drain tube (27) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(n)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(11)Install fuel/oil cooler, rear fuel drain tubing at AP25. (Ref. Fig. 409)
(a)Install jamnut (18) fingertight on elbow (2).
(b)Lubricate packing (40) with Material No.P03-001 and position on elbow (2).
(c)Install elbow (2) fingertight in port AP25.
(d)Install lower end of drain tube (24) to drain tube (37). Do not torque coupling at this step.
(e)Install upper end of drain tube (24) to elbow (2). Do not torque tube coupling at this step.

(f)Install lower end of drain tube (37) to nipple on drain tube (32). Do not torque tube coupling at this step.
(g)Install clamp (19) on drain tube (37) and attach to bracket (42).
(h)On drain tube (24) install clamp (19) on existing engine bracket fingertight.
(i)Ensure alignment of drain tubes (24) and (37) and TORQUE jamnut (18) on elbow (2) to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(j)TORQUE couplings on drain tubes (24) and (37) to between 250 - 300 lbf.in. (2.83 and 3.38 m.daN).
(k)TORQUE bolts securing clamps (19) on drain tubes (24) and (27) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(l)If not in place, install test caps on drain tube test ports and TORQUE to 150 lbf.in. (1.69 m.daN).

(12)Install air/oil cooler, engine, drain tube (32). (Ref. Fig. 409)
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in air/oil cooler, engine drain port and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Install upper end of drain tube (32) to union (11). TORQUE the coupling nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(d)Install lower end of drain tube (32) to drain tube (33). TORQUE the coupling nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(e)Ensure alignment of drain tubes (37) and (32) and TORQUE drain tube (37) coupling nut to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(f)If not in place, install test caps on drain tube test port and TORQUE to 150 lbf.in. (1.69 m.daN).

(13)Install fuel/oil cooler drain tube (35) at AP21. (Ref. Fig. 409).
(a)Install drain tube (35) fingertight on 45 degree elbow on fuel/oil cooler.
(b)Install drain tube (35) fingertight to drain tube (37).
(c)Ensure alignment of drain tubes (35) and (37) and TORQUE tube coupling nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(d)TORQUE lower end of drain tube (35) coupling nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(e)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).

(14)Install fuel/oil cooler bypass valve oil drain tube (39) at AP30. (Ref. Fig. 409).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in port AP30 and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Install drain tube (39) fingertight on union (11) and drain tube (37).
(d)Ensure alignment of drain tubes (39) and (37) and TORQUE coupling nuts to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(e)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).

(15)Install fuel/oil cooler, front fuel drain tubing (4), at drain port AP24. (Ref. Fig. 409).
(a)Lubricate packing (5) with Material No.P03-001 and position on union

(11).
(b)Install union (11) in drain port AP24 and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Install drain tube (4) fingertight on union (11) and tee fitting (25).
(d)Ensure alignment of drain tubes (4) and (24) and TORQUE couplings nuts to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).
(e)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(16)Install turbine case cooling (TCC) actuator drain tubing (Ref. Fig. 407).
(a)Lubricate packing (3) with Material No.P03-001 and position on union (2).
(b)Install union (2) in TCC actuator drain and TORQUE to 150 lbf.in. (1.69 m.daN).
(c)Install 45 degree elbow (17) fingertight on bracket (16).
(d)Install TCC actuator drain hose (1) fingertight on union (2) and elbow (17).
(e)Ensure alignment of elbow (17) and TORQUE to 300 lbf.in. (3.38 m.daN).
(f)Ensure alignment of drain hose (1) and TORQUE connectors to 300 lbf.in. (3.38 m.daN).
(g)Install drain tube (4) fingertight on elbow (17) and cross fitting (14).
(h)Install two clamps (25) fingertight on drain tube (4) at bracket (6) at two places.
(i)Ensure alignment of drain tube (4) on elbow (17) and cross fitting (14), and ensure alignment of drain tube (15) on tee (24) and cross fitting (14).
(j)TORQUE drain tube (4) and drain tube (15) connectors to 300 lbf.in. (3.38 m.daN).
(k)TORQUE clamp (25) on drain tube (15) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(l)TORQUE clamps (25) on drain tube (4) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(m)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(17)Install engine vane bellcrank drain tubing (12). (Ref. Fig. 407).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in engine bellcrank actuator port and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Install drain tube (12) fingertight to union (11) and cross fitting (14).
(d)Install clamp (25) which secures electrical cable (32) to drain tube (12) fingertight.
(e)Install clamp (25) which secures drain tube (12) to mounting bracket fingertight.
(f)Ensure that drain tube (12) and clamps (25) are aligned.
(g)TORQUE drain tube (12) connectors to 300 lbf.in. (1.69 m.daN).
(h)TORQUE two clamps (25) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).
(i)Install test caps and TORQUE to 150 lbf.in. (1.69 m.daN).
(18)Install air/oil cooler, integrated drive generator (IDG) actuator drain

tube (13). (Ref. Fig. 407).
(a)Lubricate packing (5) with Material No.P03-001 and position on union (11).
(b)Install union (11) in IDG actuator drain port and TORQUE to between 250 and 300 lbf.in. (2.83 and 3.38 m.daN).
(c)Install drain tube (13) fingertight to union (11) and cross fitting (14).
(d)Ensure alignment of drain tube (13) and TORQUE to 300 lbf.in. (3.38 m.daN).
(19)Install pylon drain tube assembly. (Ref. Fig. 410)
(a)Install pylon drain tube assembly (1) fingertight to bracket (2) with bolt (3), washer (4) and nut (5).
(b)Install two clamps (8) fingertight on pylon drain tube assembly (1) and attach to brackets on fuel nozzle pad with bolts (9), washers (10) and nut (11).
(c)Install two clamps (8) and (12) fingertight on pylon drain tube assembly (1) and attach to starter valve cooling tube with bolts (9), washers (10) and nuts (11).
(d)Ensure that pylon drain tube assembly (1) is correctly positioned and TORQUE nut (5) on bracket (2) to between 50 and 70 lbf.in. (0.57 and 0.79 m.daN).
(e)TORQUE nuts (11) on clamps (8) to between 20 and 25 lbf.in. (0.23 and 0.28 m.daN).

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).